NEW ALBANY AND FLOYD COUNTY SANITARY SEWER AND STORMWATER DESIGN MANUAL

JULY 2024

NEW ALBANY AND FLOYD COUNTY
STORMWATER AND SANITARY SEWER DESIGN MANUAL

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1.1 PURPOSE OF THE DESIGN MANUAL

This Design Manual is a guide for the planning and design of stormwater systems, erosion control structures, and associated activities for New Albany and Floyd County. In addition, the design manual addresses sanitary sewers and small sanitary pump stations for New Albany. The guidelines and general design procedures in this manual are approved by the New Albany Stormwater Board, the New Albany Sewer Board and the Floyd County Stormwater Board.

The contents of this design manual are based on the Louisville MSD design manual dated August, 2009. The Louisville MSD design manual was edited as necessary to fit New Albany and Floyd County's needs.

This Manual:

A. Enumerates design standards that have been authorized by New Albany and Floyd County to facilitate compliance with local, state and federal regulations.

B. Identifies submittal requirements and procedures for the review of infrastructure projects within the respective service areas.

C. Serves as a reference document for professional consultants in the design of infrastructure projects within the respective service areas.

1.2 DESCRIPTION AND USE OF THE DESIGN MANUAL

The Manual identifies a single set of standards, submittal requirements and approval procedures to be used in the planning and design of projects within the respective service areas.

This Manual is not intended to serve as a step-by-step design methodology nor can this Manual address every situation which may arise. The application of sound engineering/surveying principles and judgment combined with the information contained herein are necessary to complete the planning, design, and preparation of related construction documents for stormwater and sanitary sewer projects.

Approval of plans by New Albany or Floyd County shall not relieve the designer or developer from required compliance with the provisions of this manual unless a written variance is received from New Albany or Floyd County.

1.3 STRUCTURE OF THE DESIGN MANUAL

The Manual contains 15 chapters. A general table of contents is found at the beginning of the Manual. To facilitate use of the Manual, a detailed table of contents can be found at the beginning of each chapter for text and exhibits. The Manual is structured as follows:

A. Chapters 2 and 3 describe general planning and design approach, required submittals and approval procedures.

B. Chapters 4 through 7 detail standards regarding drafting construction drawings, record drawings, surveying and easement documents.

C. Chapters 8 and 9 describe standards for performing geotechnical explorations and the design of erosion control structures.

D. Chapters 10 and 11 cover the design of stormwater systems and the submittal requirements for private development drainage in New Albany and Floyd County.

E. Chapters 12 through 15 relate to the specific design of sanitary sewers, small sanitary pump stations, and odor control, and discuss the submittal requirements for private development sanitary sewer construction for the City of New Albany.

1.4 DIGITAL VERSION OF DESIGN MANUAL

A digital version of the design manual is located at the following websites:

New Albany Stormwater: http://www.newalbanystormwater.org

New Albany Wastewater: http://www.cityofnewalbany.com (select the wastewater department page)

Floyd County: http://www.floydcounty.in.gov/county%20offices/stormwater.htm

Floyd County Soil and Water Conservation District: http://www.floydswcd.org

Printable PDF versions of the respective chapters are available for download at these websites.

1.5 UPDATES TO THE DESIGN MANUAL

The Manual is intended to be a dynamic document. As design criteria and technology evolve, the Manual will require revisions and improvements. As changes are made, updates will be posted to the website version. It will be the designer's responsibility to stay updated on the manual.

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CHAPTER 2
GENERAL INFORMATION

2.1 PURPOSE

This chapter:

A. Provides an overview of the planning and design approach relating to sanitary and storm water sewers and their appurtenant facilities.

B. Summarizes the processes for submittal, review and approval of construction documents for private development projects in New Albany and Floyd County.

C. Provides information relating to area utility and external agency coordination.

D. Provides direction relating to the preparation of opinions of capital, operation, and maintenance costs.

2.2 DESIGN APPROACH

Proposed construction or expansion of sanitary sewer or stormwater facilities shall be in compliance with the following:

A. New Albany Wastewater:

1. New Albany Comprehensive Plan Year 2020 (HNTB, 1999).
2. Capacity Assurance Plan (CAP).
3. Amended Capacity Assurance Plan (CAP)
4. New Albany Code of Ordinances Chapter 51: Sewers.
5. Sewer Capacity Credit Requirements.
6. Indiana Administrative Code 327 IAC 3.
7. This New Albany and Floyd County Stormwater and Sanitary Sewer Design Manual.

B. New Albany Stormwater:

1. New Albany Comprehensive Plan Year 2020 (HNTB, 1999).
2. Stormwater Master Plan (Stantec 2010).
3. New Albany Code of Ordinances Chapter 56: Stormwater Management.

4. New Albany Code of Ordinances Chapter 154: Subdivision.

5. Indiana Administrative Code 327 IAC 15-5 (Rule 5).

6. The Indiana Storm Water Quality Manual by Indiana Department of Environmental Management (IDEM).

7. Best Management Practices Stormwater Management Manual for Southern Indiana by Southern Indiana Stormwater Advisory Committee (SISWAC).

8. This New Albany and Floyd County Stormwater and Sanitary Sewer Design Manual.

C. Floyd County Stormwater:

1. Floyd County Ordinance Regulating Construction Site Runoff and Post-Construction Stormwater Management.

2. Floyd County Illicit Discharge Ordinance.

3. Indiana Administrative Code 327 IAC 15-5 (Rule 5).

4. The Indiana Storm Water Quality Manual by Indiana Department of Environmental Management (IDEM).

5. Best Management Practices Stormwater Management Manual for Southern Indiana by Southern Indiana Stormwater Advisory Committee (SISWAC).

6. This New Albany and Floyd County Stormwater and Sanitary Sewer Design Manual.

Any person, company, corporation, or other entity proposing to develop land or to install new or replacement sanitary sewer or stormwater facilities in New Albany or Floyd County must prepare planning and design documents in accordance with the standards and requirements of this Manual and the Indiana Administrative Code (IAC) for review and approval by New Albany or Floyd County. Planning and Construction Documents must be prepared and signed by both a Professional Engineer and Land Surveyor (where applicable per IC 25-21.5-1-7), currently licensed in the State of Indiana. The service level of proposed facilities should be in accordance with standards referenced in these documents.

The Design Engineer shall refer to Chapter 10 Stormwater Facilities Design of this design manual for design standards regarding stormwater facilities in New Albany or Floyd County. For sanitary sewer and pump station design standards in New Albany, the Design Engineer shall refer to Chapter 12 Sanitary Sewer Systems, Chapter 14 Pump Stations, and Chapter 15 Odor Control.

2.3 NEW ALBANY PRIVATE DEVELOPMENT REVIEW PROCESS

An applicant proposing to develop or redevelop land in the City of New Albany shall refer to the Code of Ordinance for the City of New Albany for a description of the review processes and required submittals as well as coordinate their efforts with the New Albany Planning Department and Building Officials. Refer to New Albany's Zoning Ordinance (Chapter 156 of the Code of Ordinances for the City of New Albany) for a description of the review processes for an Improvement Location Permit, a Planned Unit Development District (PUDD), Conditional Use and Special Exception approvals, etc. See New Albany's Subdivision Control Ordinance (Chapter 154 of the Code of Ordinances for the City of New Albany) for the review process for developers requesting the approval of a plat for the subdivision of land. The New Albany Stormwater and Wastewater Departments shall be involved during the preliminary and secondary review processes. Refer to Chapter 11 of this design manual for the New Albany Stormwater Department's submittal requirements for reviewing private development drainage projects. See Chapter 13 of this design manual for the New Albany Wastewater Department's submittal requirements for reviewing private development sanitary sewer projects.

2.4 FLOYD COUNTY PRIVATE DEVELOPMENT REVIEW PROCESS

An applicant proposing to develop or redevelop land in Floyd County shall refer to Floyd County's Zoning and Subdivision Control Ordinances for a description of the review processes and required submittals as well as coordinate their efforts with the Planning Department and Building Officials. Refer to Floyd County's Zoning Ordinance for a description of the review processes for an Improvement Location Permit, a Planned Unit Development District (PUDD), Conditional Use and Special Exceptions approvals, etc. See the Floyd County Subdivision Control Ordinance for the requirements regarding subdivision approval. The Floyd County Stormwater Department shall be involved during the preliminary and secondary review processes. Refer to Chapter 11 of this design manual for the Floyd County Stormwater Department's submittal requirements for reviewing private development drainage projects.

2.5 STORMWATER QUALITY MANAGEMENT PERMIT (SWQMP)

A stormwater quality management permit (SWQMP) shall be obtained for all development or redevelopment activities in New Albany or Floyd County that result in the disturbance of one or more acres of land, including land disturbing activities on individual lots of less than one acre that are part of a larger common plan of development or sale. The SWQMP application and fee shall be submitted to the Auditor's office located in the City-County Building. Once construction plans are complete for a development requiring a SWQMP, the developer shall submit the Notice of Intent (NOI), a Perimeter Control Plan (PCP), a Stormwater Pollution Prevention Plan (SWPPP), and a Post-Construction Stormwater Pollution Prevention Plan to the Floyd County Soil and Water Conservation District (SWCD) for review. These items must be approved by the Floyd County SWCD prior to breaking ground or disturbing soil.

For information on the SWQMP process and submittal and inspection requirements, refer to the New Albany Stormwater Management Ordinance (Chapter 56 of the Code of Ordinances for the City of New Albany) or the Floyd County Ordinance Regulating Construction Site Runoff and Post-Construction Stormwater Management.

2.6 UTILITIES/AGENCY COORDINATION

The Design Engineer and/or Developer shall coordinate the design of all sanitary sewer and stormwater facilities with all utilities and external agencies actively involved in the provision of service in New Albany or Floyd County. For example, the involvement of external agencies may include:

A. The design of new sanitary sewer facilities or an expansion to existing facilities requires the approval of the Indiana Department of Environmental Management (IDEM).

B. Construction within regulated streams and regulatory floodplains requires the approval of and permit by IDEM and the U.S. Army Corps of Engineers.

C. Construction in a floodway requires a permit issued by the Indiana Department of Natural Resources.

D. Work within federal and state highway rights-of-ways requires approval and/or a permit by the Indiana Department of Transportation (INDOT).

Contact shall be made with such agencies prior to the final design submittal to New Albany or Floyd County. New Albany or Floyd County should be given a copy of all correspondence with utilities and external agencies. A partial listing of utilities and agencies is included in Exhibit 2-1.

2.7 OPINIONS OF COST (FOR CAPITAL IMPROVEMENT PROJECTS)

Opinions of probable cost shall be based on the best professional judgement of the Design Engineer. The Design Engineer should use recent bid tabulations, and information from suppliers and contractors in formulating opinions of cost. Opinions of capital cost shall be in the Construction Specification Institute (CSI) format and shall be grouped by category. Opinions of capital cost should include a construction contingency, allocations for planning and design, and a cost for necessary land, easement, or right-of-way acquisition. The amount or percentage of these contingencies and allocations are dependent upon project specifics and the stage of project development. Opinions of operation and maintenance cost shall include costs for labor, utilities, maintenance and repair. Energy efficiency shall be considered in the design.

2.8 PERMIT REQUIREMENTS

A summary of requirements for permits is shown as Exhibit 2-2. The Exhibit contains individual lists for drainage projects, pump station/structural projects, and sanitary sewer and force main projects. The list should not be considered all-inclusive, and the designer will need to confirm all permit requirements as a part of the preliminary scope of the project. The following is a brief summary of the major permits that impact projects in the New Albany and Floyd County service area. Some commonly required permits include:

A. **Section 404 - Nationwide Permit No. 12 of 33 CFR Part 330** from the U.S. Army Corps of Engineers. Conditions of this permit may require a Water Quality Certification from IDEM (see Item B below). A permit is required for discharges of soil, sand, gravel or dredged material into waters of the U.S. Design Engineers must inquire from the U.S. Army Corps of Engineers if a certain stream requires this permit.

B. **Section 401 - Application for Water Quality Certification** from IDEM must be issued or waived before a federal permit under Section 404 is granted (Item A above). Section 401 of the Clean Water Act requires certification from the state that the discharge of the dredge or fill material will not violate the water quality standards of the state.

C. **Sanitary Sewer Construction Permit** administered by IDEM. Indiana Administrative Code 327 IAC 3 requires that a construction permit must be obtained before construction can begin for a new or expanded wastewater treatment plant, a new sanitary sewer, pump station, or force main.

D. **Construction/Land Disturbance Storm Water Permitting (327 IAC 15-5, Rule 5)** administered by IDEM. This is a general permit program that targets construction activities that result in land disturbance of one acre or more. 327 IAC 15-5 is designed to reduce pollutants, principally sediment, that are a result of soil erosion and other activities associated with land-disturbing activities.

EXHIBIT 2-1
NEW ALBANY UTILITIES AND AGENCIES

EFFECTIVE DATE: DECEMBER 2012

Indiana-American Water
2423 Middle Road
Jeffersonville, IN 47130
812-218-1500

Silver Creek Water Corporation
8104 County Line Road
Sellersburg, IN 47172
812-246-2889

Edwardsville Water Corporation
545 Maplewood Blvd
Georgetown, IN 47122
812-948-0900

Borden Tri-County Regional Water District
1791 West Water Street
Borden, IN 47106
812-967-2226

Floyds Knobs Water Company
4781 Paoli Pike #1
Floyds Knobs, IN 47119
812-923-9040

Vectren Gas
P.O. Box 209
Evansville, IN 47702-0209
812-491-4000
800-227-1376

Duke Energy
1110 Clifty Dr.
Madison, IN 47250
812-265-4217

Clark County REMC
7810 State Road 60
PO Box 411
Sellersburg, IN 47172
812-246-3316

Harrison REMC
PO Box 517
1165 Old Forest Road
Corydon, IN 47112
812-738-4115

AT&T
510 E. Spring St.
New Albany, IN 47150
812-948-7181

Insight Cable
1608 Vance Avenue
New Albany, IN 47150
502-357-4400

INDOT- Seymour District
185 Agrico Lane
Seymour, IN 47274
877-305-7611

IDEM
100 N. Senate Ave
Indianapolis, IN 46204-2251
317-232-8603

New Albany-Floyd County Consolidated School Corporation
2813 Grant Line Road
New Albany, IN 47150
812-949-4200

New Albany Planning & Zoning
311 Hauss Square, Room 329
New Albany, IN 47150-3586
812-948-5333

New Albany Building Department
311 Hauss Square, Room 329
New Albany, IN 47150-3586
812-948-5333

New Albany Stormwater Department
2113 Grant Line Road
New Albany, IN 47150-3586
812-945-1989

New Albany Wastewater Department
38 W 10th Street
New Albany, IN 47150
812-948-5320

Indiana-American Water
2423 Middle Road
Jeffersonville, IN 47130
812-218-1500

Silver Creek Water Corporation
8104 County Line Road
Sellersburg, IN 47172
812-246-2889

Edwardsville Water Corporation
545 Maplewood Blvd
Georgetown, IN 47122
812-948-0900

Floyds Knobs Water Company
4781 Paoli Pike #1
Floyds Knobs, IN 47119
812-923-9040

Borden Tri-County Regional Water District
1791 West Water Street
Borden, IN 47106
812-967-2226

Greenville Water Utility
9706 Clark St.
Greenville, IN 47124
812-923-9821

Ramsey Water Company
415 Highway 64 NW
PO Box 245
Ramsey, IN 47166
812-347-2551

Georgetown Utilities
Georgetown Public Works Department
1070 Copperfield Drive
Georgetown, IN 47122
812-951-3800

Elizabeth Water Company
8128 Hurricane Street SE
Elizabeth, IN 47117
812-969-2025

Vectren Gas
P.O. Box 209
Evansville, IN 47702-0209
812-491-4000
800-227-1376

Duke Energy
1110 Clifty Dr.
Madison, IN 47250
812-265-4217

Clark County REMC
7810 State Road 60
PO Box 411
Sellersburg, IN 47172
812-246-3316

Harrison REMC
PO Box 517
1165 Old Forest Road
Corydon, IN 47112
812-738-4115

Insight Cable
1608 Vance Avenue
New Albany, IN 47150
502-357-4400

AT&T
510 E. Spring St.
New Albany, IN 47150
812-948-7181

IDEM
100 N. Senate Ave
Indianapolis, IN 46204-2251
317-232-8603

INDOT- Seymour District
185 Agrico Lane
Seymour, IN 47274
877-305-7611

New Albany-Floyd County Consolidated School Corporation
2813 Grant Line Road
New Albany, IN 47150
812-949-4200

New Albany Wastewater Department
38 W 10th Street
New Albany, IN 47150
812-948-5320

Floyd County Stormwater Department
Pine View Government Center
2524 Corydon Pike, Suite 201
New Albany, IN 47150
812-949-5446

Floyd County Plan Commission
Pine View Government Center
2524 Corydon Pike, Suite 203
New Albany, IN 47150
812-948-5440

Floyd County Soil & Water Conservation Department
Pine View Government Center
2524 Corydon Pike, Suite 103
New Albany, IN 47150
812-945-9936

Floyd County Commissioners
Pine View Government Center
2524 Corydon Pike, Suite 204
New Albany, IN 47150
812-948-5466

REQUIRED PERMITS FOR DRAINAGE PROJECTS

SUBMITTED	APPROVED	PERMIT	REQUIRED SUBMITTALS	AGENCY	WHEN REQUIRED
		Section 404- Nationwide Permit No. 12 of 33 CFR Part 330	Application, drawings	Army Corps of Engineers	For discharges of soil, sand, gravel, or dredged material into a regulated stream. May require IDEM Water Quality Certification.
		Section 401, Clean Water Act- Water Quality Certification	Application, location map, drawings, cross sections, site photos	Indiana Department of Environmental Management	When a project is planned in Indiana that will impact a wetland, stream, river, lake, or other Water of the U.S. A Section 401 WQC is a required component of a federal permit and must be issued before a federal permit or license can be granted.
		Construction in a Floodway	Application, location map, site map, drawings, photos	Indiana Department of Natural Resources	For excavation, fill, or construction in a floodway.
		Construction/Land Disturbance Storm Water Permitting (327 IAC 15-5, Rule 5)	Notice of Intent, proof of publication, application fee, construction plan review approval	Indiana Department of Environmental Management	General permit that targets construction activities that result in land disturbance of one acre or more.
		Encroachment Permit	Application, drawings	Indiana Department of Transportation	When encroaching on state right-of-way
		Encroachment Permit	Drawings	New Albany Street Department	When encroaching on city right-of-way
		Encroachment Permit	Drawings	Floyd County Highway Department	When encroaching on county right-of-way
		Lane Closure Approval	Drawings	New Albany Board of Public Works	When necessary to close lanes of traffic in New Albany
		Lane Closure Approval	Drawings	Floyd County Commissioners	When necessary to close lanes of traffic in Floyd County
		New Albany Improvement Location Permit	See New Albany Zoning Ordinance (Chapter 156) for required submittals	New Albany Plan Commission	For all newly erected, constructed, reconstructed, extended, structurally altered or moved structures and for changes in land, building, or structure use in New Albany.
		New Albany Subdivision Approval	See New Albany Subdivision Control Ordinance (Chapter 154) for required submittals	New Albany Plan Commission	For a proposed subdivision in New Albany
		New Albany Planned Unit Development District (PUDD) Approval	See New Albany Zoning Ordinance (Chapter 156) for required submittals	New Albany Plan Commission	For a Planned Unit Development District in New Albany
		New Albany Stormwater Board Approval	See Chapter 10 (for capital improvement projects) or Chapter 11 (for private development) of this Design Manual for submittal requirements	New Albany Stormwater Board	For all land development or drainage projects in New Albany
		New Albany Stormwater Quality Management Permit (SWQMP)	SWQMP Application, Notice of Intent (NOI), Perimeter Control Plan (PCP), Stormwater Pollution Prevention Plan (SWPPP), Post-Construction SWPPP, construction plans, etc.	Floyd County Soil and Water Conservation District	All development or redevelopment activities in New Albany that result in the disturbance of one or more acres of land, including land disturbing activities on individual lots of less than one acre as part of a larger common plan of development or sale.
		Floyd County Improvement Location Permit	See the Floyd County Zoning Ordinance for submittal requirements	Floyd County Building Commissioner	For all newly erected, constructed, reconstructed, extended, structurally altered or moved structures and for changes in land, building, or structure use in Floyd County
		Floyd County Subdivision Approval	See the Floyd County Subdivision Control Ordinance for submittal requirements	Floyd County Plan Commission	For a proposed subdivision in Floyd County
		Floyd County Planned Unit Development District (PUDD) Approval	See the Floyd County Zoning Ordinance for submittal requirements	Floyd County Plan Commission	For a Planned Unit Development District in Floyd County
		Floyd County Stormwater Board Approval	See Chapter 10 (for capital improvement projects) or Chapter 11 (for private development) of this Design Manual for submittal requirements	Floyd County Stormwater Board	For all land development or drainage projects in Floyd County
		Floyd County Storm Water Quality Management Permit (SWQMP)	SWQMP Application, Notice of Intent (NOI), Perimeter Control Plan (PCP), Stormwater Pollution Prevention Plan (SWPPP), Post-Construction SWPPP, construction plans, etc.	Floyd County Soil and Water Conservation District	All development or redevelopment activities in Floyd County that result in the disturbance of one or more acres of land, including land disturbing activities on individual lots of less than one acre as part of a larger common plan of development or sale.

REQUIRED PERMITS FOR PUMP STATIONS/STRUCTURES PROJECTS

SUBMITTED	APPROVED	PERMIT	REQUIRED SUBMITTALS	AGENCY	WHEN REQUIRED
		Section 404- Nationwide Permit No. 12 of 33 CFR Part 330	Application, drawings	Army Corps of Engineers	For discharges of soil, sand, gravel, or dredged material into a regulated stream. May require IDEM Water Quality Certification.
		Section 401, Clean Water Act- Water Quality Certification	Application, location map, drawings, cross sections, site photos	Indiana Department of Environmental Management	When a project is planned in Indiana that will impact a wetland, stream, river, lake, or other Water of the U.S. A Section 401 WQC is a required component of a federal permit and must be issued before a federal permit or license can be granted.
		Construction in a Floodway	Application, location map, site map, drawings, photos	Indiana Department of Natural Resources	For excavation, fill, or construction in a floodway.
		Sanitary Sewer Construction Permit	Application, drawings, specifications, Capacity Certification/Allocation Letter from Utility, design summary, affected parties list	Indiana Department of Environmental Management	For construction of sanitary sewer and lift stations
		Construction/Land Disturbance Storm Water Permitting (327 IAC 15-5, Rule 5)	Notice of Intent, proof of publication, application fee, construction plan review approval	Indiana Department of Environmental Management	General permit that targets construction activities that result in land disturbance of one acre or more.
		Encroachment Permit	Application, drawings	Indiana Department of Transportation	When encroaching on state right-of-way
		Encroachment Permit	Drawings	New Albany Street Department	When encroaching on city right-of-way
		Encroachment Permit	Drawings	Floyd County Highway Department	When encroaching on county right-of-way
		Lane Closure Approval	Drawings	New Albany Board of Public Works	When necessary to close lanes of traffic in New Albany
		New Albany Improvement Location Permit	See New Albany Zoning Ordinance (Chapter 156) for required submittals	New Albany Plan Commission	For all newly erected, constructed, reconstructed, extended, structurally altered or moved structures and for changes in land, building, or structure use in New Albany.
		New Albany Subdivision Approval	See New Albany Subdivision Control Ordinance (Chapter 154) for required submittals	New Albany Plan Commission	For a proposed subdivision in New Albany
		New Albany Planned Unit Development District (PUDD) Approval	See New Albany Zoning Ordinance (Chapter 156) for required submittals	New Albany Plan Commission	For a Planned Unit Development District in New Albany
		New Albany Sanitary Sewer Board Approval	See Chapters 12, 14, and 15 (for capital improvement projects) or Chapter 13 (for private development) of this Design Manual for submittal requirements	New Albany Sanitary Sewer Board	For all land development or capital improvement sanitary sewer projects in New Albany
		Sewer Credit Approval	Application, Calculations, Site Plan	New Albany Sanitary Sewer Board/ IDEM	For all sanitary sewer projects in New Albany. Sewer credits must be secured prior to design approval and connection to the sewer system.
		New Albany Stormwater Quality Management Permit (SWQMP)	SWQMP Application, Notice of Intent (NOI), Perimeter Control Plan (PCP), Stormwater Pollution Prevention Plan (SWPPP), Post-Construction SWPPP, construction plans, etc.	Floyd County Soil and Water Conservation District	All development or redevelopment activities in New Albany that result in the disturbance of one or more acres of land, including land disturbing activities on individual lots of less than one acre as part of a larger common plan of development or sale.
		The City of New Albany Building Permit	Application, Property Survey, Site Plan, Assessor's Plat	New Albany Building Commission	For any project with a building in New Albany
		Request for Final Inspection & Certificate of Occupancy	Application	New Albany Building Commission	

REQUIRED PERMITS FOR SANITARY SEWER AND FORCE MAIN PROJECTS

SUBMITTED	APPROVED	PERMIT	REQUIRED SUBMITTALS	AGENCY	WHEN REQUIRED
		Section 404- Nationwide Permit No. 12 of 33 CFR Part 330	Application, drawings	Army Corps of Engineers	For discharges of soil, sand, gravel, or dredged material into a regulated stream. May require IDEM Water Quality Certification.
		Section 401, Clean Water Act- Water Quality Certification	Application, location map, drawings, cross sections, site photos	Indiana Department of Environmental Management	When a project is planned in Indiana that will impact a wetland, stream, river, lake, or other Water of the U.S. A Section 401 WQC is a required component of a federal permit and must be issued before a federal permit or license can be granted.
		Construction in a Floodway	Application, location map, site map, drawings, photos	Indiana Department of Natural Resources	For excavation, fill, or construction in a floodway.
		Sanitary Sewer Construction Permit	Application, drawings, specifications, Capacity Certification/Allocation Letter from Utility, design summary, affected parties list	Indiana Department of Environmental Management	For construction of sanitary sewer and lift stations
		Construction/Land Disturbance Storm Water Permitting (327 IAC 15-5, Rule 5)	Notice of Intent, proof of publication, application fee, construction plan review approval	Indiana Department of Environmental Management	General permit that targets construction activities that result in land disturbance of one acre or more.
		Encroachment Permit	Application, drawings	Indiana Department of Transportation	When encroaching on state right-of-way
		Encroachment Permit	Drawings	New Albany Street Department	When encroaching on city right-of-way
		Encroachment Permit	Drawings	Floyd County Highway Department	When encroaching on county right-of-way
		Lane Closure Approval	Drawings	New Albany Board of Public Works	When necessary to close lanes of traffic in New Albany
		New Albany Subdivision Approval	See New Albany Subdivision Control Ordinance (Chapter 154) for required submittals	New Albany Plan Commission	For a proposed subdivision in New Albany
		New Albany Planned Unit Development District (PUDD) Approval	See New Albany Zoning Ordinance (Chapter 156) for required submittals	New Albany Plan Commission	For a Planned Unit Development District in New Albany
		New Albany Sanitary Sewer Board Approval	See Chapters 12, 14, and 15 (for capital improvement projects) or Chapter 13 (for private development) of this Design Manual	New Albany Sanitary Sewer Board	For all land development or capital improvement sanitary sewer projects in New Albany
		Sewer Credit Approval	Application, Calculations, Site Plan	New Albany Sanitary Sewer Board/ IDEM	For all sanitary sewer projects in New Albany. Sewer credits must be secured prior to design approval and connection to the sewer system.
		New Albany Stormwater Quality Management Permit (SWQMP)	SWQMP Application, Notice of Intent (NOI), Perimeter Control Plan (PCP), Stormwater Pollution Prevention Plan (SWPPP), Post-Construction SWPPP, construction plans, etc.	Floyd County Soil and Water Conservation District	All development or redevelopment activities in New Albany that result in the disturbance of one or more acres of land, including land disturbing activities on individual lots of less than one acre as part of a larger common plan of development or sale.

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CHAPTER 3
GENERAL PLANNING INFORMATION

CHAPTER 3
GENERAL PLANNING INFORMATION

3.1 PURPOSE

This chapter:

A. Identifies the sources of planning and design information for development of sanitary sewer and stormwater drainage infrastructure in the respective service areas.

B. Identifies the goals of New Albany's Capacity Assurance Plan, Comprehensive Plan Year 2020, and the Stormwater Master Plan.

C. Identifies the goals of Floyd County's Comprehensive Land Use Plan.

3.2 PLANNING APPROACH

New Albany and Floyd County's regional approach for the planning, design, construction, operation and maintenance of sanitary sewer and stormwater facilities is structured to ensure a level of service that protects the general health, safety, and welfare of the citizens of the respective service areas. This approach will also further efforts to satisfy local, state and federal regulations as they relate to water quality.

New Albany and Floyd County planning documents, including the New Albany Comprehensive Plan, the New Albany Capacity Assurance Plan, the New Albany Stormwater Master Plan, and Floyd County's Comprehensive Land Use Plan provide the framework for planning and design of sanitary sewer and stormwater facilities in the service area. The Design Engineer should use these documents for planning and as reference documents for the development of sanitary sewer and stormwater facilities.

3.3 NEW ALBANY CAPACITY ASSURANCE PLAN (CAP)

The New Albany Capacity Assurance Plan (CAP) (2001) and amendments identify improvements needed within the wastewater collection and treatment system to comply with the Consent Decree agreement between the City of New Albany, and the Environmental Protection Agency (EPA).

3.4 NEW ALBANY COMPREHENSIVE PLAN YEAR 2020

The New Albany Comprehensive Plan was updated in 1999 by HNTB and is a planning document that projects the physical, social, and economic growth and redevelopment that will occur in New Albany up to year 2020. The document discusses existing demographic, economic, and land use trends and projects future land use trends and market opportunities and the corresponding impacts the growth will have upon City services, facilities, utilities, parks, recreational facilities, and transportation.

3.5 NEW ALBANY STORMWATER MASTER PLAN

The goal of the 2010 New Albany Stormwater Master Plan is to provide a regional approach to develop a consistent level of drainage service and maintain or improve water quality across the City. The plan identifies and prioritizes stormwater improvement projects for the City to address existing drainage issues and to avoid future drainage issues.

3.6 FLOYD COUNTY COMPREHENSIVE LAND USE PLAN UPDATE

The Floyd County Comprehensive Plan was updated in 2005 in order to understand the present land development conditions and trends in Floyd County and to adjust the community's land development goals and objectives accordingly.

3.7 REGIONAL FACILITIES

New Albany and Floyd County realize that in some cases regional facilities are more appropriate, cost effective, and assure proper operation and maintenance compared to on-site detention facilities. The requirement to build or participate in the cost of regional facilities shall be determined concurrently with the review by New Albany or Floyd County of the developer's proposed development plans and by an analysis of the development's impact on the general community. This impact includes watershed, other development, existing service facilities, and its conformance with existing master plans.

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CHAPTER 4

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CHAPTER 4
CADD STANDARDS

4.1 GENERAL

New Albany and Floyd County has adopted CADD standards to provide consistency with respect to plan and document development and for compatibility with respect to the sharing of data and document storage. New Albany and Floyd County operate in the AutoCAD environment. Emphasis has been placed on developing standards that are in line with current industry procedures, but can be easily adapted to change with industry advancements.

Development plans for sanitary sewer and stormwater construction shall be prepared in a neat and professional manner and shall conform to the standards detailed in this chapter. It is important that information be presented in such a manner that it will be legible when the plans are scanned, reproduced, or reduced. The following section presents the standards that shall be adhered to on all New Albany and Floyd County Capital Improvement projects and Private Development plans. The standard Layer Names, Colors, Text Heights, Line Weights, Standard Symbols, and Standard Abbreviations are shown in Exhibits 4-1 through 4-5 at the end of this chapter.

4.2 CADD STRUCTURE

4.2.1 CADD Environment

A. The electronic files will be shared and referenced by many different individuals. Therefore, this chapter outlines the minimum standards, conventions, and formats necessary to ensure a usable electronic file data set to all users.

B. It must be stressed that while the CADD Standards are to be applied to the deliverable files for design plans, they should not be used to restrict the user's options or workflows during plan development. Interim drawings for public meetings, reviews, etc. may deviate from the suggested workflows and standards if needed for particular display or presentation requirements.

C. All drawings shall be in AutoCAD format, compatible with the current version that New Albany and Floyd County are running. The project manager should check with New Albany and Floyd County for version information before any CADD work begins.

D. In addition to hard copy drawings, all final drawings are to be submitted in AutoCAD and pdf formats per the requirements of this chapter.

E. Model space shall be used for all drafting. Paper space may be used for borders, viewports, and plotting. Modelspace contains the model at "real life" size. Printing is from paperspace at 1:1 scale for full-size prints.

Scales

The appropriate scales for original plans are 1" = 50' horizontal with vertical scale of 1" = 5' and 1" = 20' horizontal with vertical scale of 1" = 2'. Other scales may be allowed with prior approval of New Albany or Floyd County for the purpose of clarity. A graphic scale is required. In addition, crossings of state highways may require additional sheets at different scales. Coordination between New Albany or Floyd County and INDOT will be necessary.

AutoCAD Template File

An AutoCad template will be created to incorporate the standards as described in this chapter. This file will contain the standard layers, linetypes, fonts, and symbols (blocks), and can be downloaded from the New Albany and Floyd County websites listed in Chapter 1, section 1.4 of this design manual.

Standard Layers and Line Types

The standard New Albany and Floyd County layers are presented in Exhibit 4-1. All drawing elements shall be placed on one of these layers. The color and line style attributes for all drawing elements shall be set to “By Layer”. Custom Linestyles are also shown in Exhibits 4-1 and 4-2.

Standard Symbols and Abbreviations

The standard symbols are presented in Exhibit 4-3 and standard abbreviations are presented in Exhibit 4-5.

Pen Size Assignments

The chart in Exhibit 4-4 shows the relationship between colors and pen sizes (weights).

Screening

For screening options - See Exhibit 4-4. The intent is for existing features (topography, etc.) to be screened.

Standard Sheets

The standard sheet size is 24” x 36” for all sanitary and stormwater projects. The sheets are presented in Exhibit 4-6 and the standard title block is presented in Exhibit 4-7.

Text Fonts, Sizes, and Weights

All fonts, sizes, and weights will be preset attributes in the New Albany and Floyd County template drawing file. The standard font style on New Albany and Floyd County projects is “simplex.shx”.

The text heights used are synonymous with the Leroy Scale of hand drafting. The following chart shows the height for each text style used. In general, Upper and Lower Case shall be used to denote existing text and UPPER case shall be used to denote proposed text.

TEXT STYLE	HEIGHT (inches)	Notes
L60	0.06	For existing text on plats where space is limited. (Upper & Lower Case)
L80	0.08	All existing text. (Upper & Lower Case)
L100	0.10	For Proposed Item Annotation where space is limited (UPPER CASE)
L120	0.12	For Proposed Item Annotation / Construction Notes. (UPPER CASE)
L140	0.14	For Note Titles & Other Misc. Labels (UPPER CASE)
L175	0.175	Misc. Titles / Labels (UPPER CASE)
L200	0.20	Misc. Titles / Labels (UPPER CASE)

4.2.2 Submittal of Final Plans

General

A. Every sheet in the final plan set shall have a corresponding AutoCAD and pdf file. That is, one AutoCAD file and one pdf file per plan sheet. A one to one relationship between the design file content and the plotted sheets shall be maintained.

B. No external references shall be allowed for the final submittal. Paper space shall be used to represent the actual sheet at a 1:1 scale. All sanitary and storm projects performed for New Albany and Floyd County shall be submitted digitally per the requirements of section 4.2.1.

C. All mapping features and all design features in plan view located in model space of the CAD drawings shall maintain their true coordinate location values. Please reference Chapter 6, “Surveying” for additional details on coordinate systems. Detail sheets do not have to be shown in true coordinate location.

D. A one-to-one relationship between the design file content and the plotted sheets shall be maintained. i.e., there is no “hidden” information that is turned “off” or “frozen” to make the final plot.

File Naming

At the completion of the plans, the CADD files are to be delivered with the following naming sequence:

AAAAA-SBBB.dwg.

Where:

AAAAA = Project Number.

BBB = sheet number. Use zeroes as necessary.

The “S” stands for sheet(s) and it is not to be changed.

Example: The digital AutoCAD file for Sheet 47 of Project Number 12345 would be named as follows: 12345_S047.dwg.

The files shall be stored in a parent folder named for the Project Number and name of the project and be delivered to New Albany or Floyd County on a CD or DVD media format.

A final set of plans shall be printed on 24”x36” paper. This set of plans shall be stamped, signed and dated by the professional engineer of record.

4.3 STANDARD AND TYPICAL DRAWINGS

4.3.1 Definitions

A. Standard Drawings - Details that indicate the acceptable procedure, dimensions, or timetable for a particular facet of construction. The details are not to be modified and can be made a part of the plan set by referencing the respective drawing number on the front Title Sheet. New Albany and Floyd County have adopted standard drawings issued by Louisville MSD and are included in Appendix A of this Design Manual. If changes are made to a particular standard drawing for a project, the detail ceases to be a standard drawing and becomes a special detail. The special detail will then need to conform to the requirements of Section 4.3.5.

B. Special Details - There are numerous exhibits and design aids found in other chapters of this manual. The details will vary from project to project. Use of the details is encouraged; however, the detail, in its final form, will need to conform to the requirements of Section 4.3.5.

C. Typical Drawings - Examples of typical sheets illustrating the format and information required on New Albany and Floyd County contract plans are provided as reference. The respective sheets and exhibit numbers are listed below.

Exhibit	Title
4-8	Sample Title Sheet
4-9	Sample Plan Index Sheet
4-10	Sample Drainage Map (Sanitary Collector System)
4-11	Sample Drainage Map (Storm Collector System)
4-12	Sample Horizontal and Vertical Control Map
4-13	Sample Plan Sheet
4-14	Sample Profile Sheet
4-15	Sample Cross Section Sheet
4-16	Sample Property Acquisition Summary Sheet

4.3.2 Title Sheet Requirements

A Sample Title Sheet can be found on Exhibit 4-8. For each project, the title sheet shall have at least the minimum information listed on it:

A. Project No.

B. Name of Project

C. Index of Drawings

D. Name and Address of Engineer

E. Design Segment Designation (where applicable)

F. Sheet____of____

G. For sanitary interceptor and major storm sewer contracts, the proposed sewers for which the plans are drawn shall be shown. The stations at the extremities of the project shall be shown and identified with leaders and arrows. For example: BEGIN PROJECT MC-1, STA. 5+42.00 and END PROJECT MC-1, STA. 10+51.03.

H. To notify the Contractor of the procedure required for the location of utilities prior to construction, the following note should be placed on the Title Sheet.

"NOTE: CAUTION EXISTING UTILITIES"

"THE INFORMATION SHOWN ON THESE DRAWINGS CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL-INCLUSIVE. LOCATION, SIZE, AND MATERIAL SHOWN ON UTILITIES ARE FROM AVAILABLE RECORDS SUPPLIED BY THE RESPECTIVE UTILITY COMPANY. INDIANA 811-CALL BEFORE YOU DIG MUST BE NOTIFIED 2 BUSINESS DAYS PRIOR TO ANY EXCAVATION FOR VERIFICATION OF LOCATION, SIZE AND MATERIAL, DIAL 811 or 1-800-382-5544.

I. Other Agency's Standard Drawings pertaining to project (INDOT, etc.) with standard drawing number and description.

J. Revision Block with date & comments.

4.3.3 Title Block Requirements

All sheets included in the plans, except the Title Sheet and the Standard Drawings, shall contain a title block, which conforms to the sample shown in the Exhibit 4-7. Information in the Title Block should include the project title indicating sanitary or drainage plans, what type of sheet, and the specific information on the sheet.

4.3.4 Plan Index Sheet Requirements

A Plan Index Sheet shall be prepared to identify the location of the work shown on each Plan Sheet. A Sample Plan Index Sheet is shown on Exhibit 4-9. The Plan Index Sheet shall include a reference to the location of the profile for the sewer lines on each plan sheet if the profile is on a separate sheet. For most projects, the Plan Index Sheet may be shown on the Project Map, which is located on the Title Sheet.

4.3.5 Special Details

The Design Engineer should show any proposed construction that is not covered by the Standard Drawings as a detail on a Special Detail sheet. The detail should clearly and accurately depict the proposed construction. Junction chambers, special pipe bedding, railroad crossings, pump stations, select erosion control measures, and modifications to any of the Standard Drawings are typical examples of items that may require a Special Detail.

4.3.6 Drawing Number Convention (Projects using Multiple Disciplines)

The drawing number shall consist of two parts: The 1st part is the letter corresponding to the discipline. The second part is the numerical page number in that subset.

List of Discipline	
General	(G)
Civil/Site	(C)
Process	(D)
Structure	(S)
Architectural	(A)
Mechanical/HVAC	(M)
Electrical	(E)
Instrumentation & Control	(I)
Examples: G-1, G-2, S-1, S-2, etc.	

4.4 PLAN, PROFILE, AND CROSS-SECTION FORMAT

4.4.1 General Criteria

The plan view of proposed sewer or drainage construction generally should be shown on the same sheet as the profile with the plan view located at the bottom of the sheet and the profile at the top. Samples of the plan and profile sheets can be found in Exhibits 4-13 and 4-14. However, if drafting efficiency can be achieved, the plan view may be shown on a separate sheet from the profile. In this case, the plan sheet and profile sheets shall be cross-referenced. The entire profile for each line shall be shown on one sheet when possible. A profile sheet with profiles for more than one plan sheet can be accepted. Profiles shown on sheets separate from the plan views should follow the plan views in a logical order. The information, which appears, on both the plan and profile views shall, at the minimum, include:

A. The location of all proposed manholes, cleanouts, inlets, catch basins and all associated stations shall be shown.

B. House numbers for all residences and businesses shall be shown and drawn parallel with the streets in the plan view.

C. All existing pipes, culverts and appurtenances shall be hatched.

D. The sizes, locations, and invert elevations, if applicable, of the following items shall be shown:

1. Stubs

2. Drop Inlets

3. Stacks

4. Borings and Soundings

5. Catch Basin Inlets

6. Downspout Connections

7. Property Service Connections

E. All existing pipes, culverts, conduits, and utilities of any nature, crossing the proposed improvement location, shall be plotted and labeled in the plan and profile.

F. A beginning and ending contract note and station shall be shown on the Title Sheet and in the plans for all interceptor sewers, major through channels and major storm sewers.

G. Match lines shall be used for transitioning coverage from one sheet to the next. A cross-reference shall be shown on each sheet to identify the location of the attendant profile or plan sheet

H. No overlap of plan coverage from one sheet to the next is permitted. Match lines are to be used in plan view with proper referencing station and attendant sheet number.

I. Title Blocks are required for all sheets except cross-sections. Cross-section information to be used should be similar to that shown in Exhibit 4-15.

J. One-hundred-foot stations shall be shown.

K. Plan sheets must include a north arrow.

4.4.2 Plan View

In addition to those items listed in Section 4.4.1, the information to appear in the plan view shall include, but not be limited to, the following:

A. Locations of future connections (PSC, stubs, etc.).

B. The delta angle of all PI's, except where more than one line intersects at the same manhole or inlet. In those instances, the angles relating all lines shall be shown. When the delta angle is shown, its direction shall be noted (left or right), as the stations increase. All angles shall be shown to the nearest second.

C. The location of the centerline shall be referenced by dimensions to the easement lines and to the appropriate property lines.

D. When it is necessary to orient the alignment to a general locality, indicate the name and direction of the nearest street intersection with a distance to that intersection.

E. Bench marks shall be accurately plotted and labeled on the plans. A description and location of each bench mark, including its station and offset relative to the proposed line, shall be plotted and labeled. When bench marks cannot be plotted with the plan coverage, their location and description should still be shown on the plans where it would have appeared.

F. The precise location of all soundings and borings.

G. Houses, fences and drives shall be shown for a minimum of 50 feet beyond the right-of-way or to the fronts of the houses for lines located in the street or rights-of-way. Trees, steps, walks and other topographic features shall be shown to the extent that they may be pertinent to the improvement location or construction. These items must be field located. Trees shall be shown with a designation of size and type with the dripline depicted graphically.

H. Property lines, lot lines, easement lines and other boundary lines shall be shown a minimum of 75 feet beyond any proposed or existing right-of-way. In instances where additional information might be required, the limit shall be extended.

I. Property Service Connection symbols for sanitary sewers, as shown in Exhibit 4-3 shall be shown near the lot line where service is expected to be required. For consistency, the symbol should be shown approximately 20 feet behind the property line. If a specific location for the connection needs to be shown, an arrow shall be added to the symbol indicating the desired location of service and a note shall be shown in the area indicating the station of the proposed Property Service Connection.

J. Generally, only the outside lines of a pipe shall be shown on the plans. However, a thin centerline shall be shown within these outside lines where any of the following conditions exist:

1. A distance is shown from a point or line to the centerline of the pipe.

2. The delta angle is shown.

3. The angle of intersection is shown.

Pipes larger than 24 inches in diameter should be drawn to scale to depict the true impact limits.

K. Existing ditches with a bottom width of 4 feet or less should be drawn using the centerline of the ditch. If the ditches and channels have a bottom width greater than 4 feet, each side of the ditch should be drawn and its width be noted. Where ditch paving exists, the width of the paved area shall be shown.

L. Existing and proposed sewers, their direction of flow, size, and material shall be shown. The Deed Book and Page Number shall be shown for existing Sewer or Drainage Easements, which are impacted by sewer construction.

M. All water lines, gas lines, oil lines, electric and telephone conduits, fiber optic cables, and any other underground or overhead utilities shall be shown with the size or primary voltage and ownership identified.

N. All existing or proposed sewers, manholes and catch basins.

O. When sanitary sewers are to be in existing streets, the front dimension and bearing, if possible, of each lot shall be shown. When sanitary sewers are to be placed in easements or rights-of-way, property line dimensions adjacent to the proposed sewer construction shall be shown.

P. Highways, street names, alleys, or major streams and ditches shall be shown. The width and type of all surfaces shall be indicated.

Q. Street right-of-way widths shall be shown adjacent to and after the street name. For example: ROBIN ROAD (50' R/W) or ROBIN ROAD (R/W varies) - if the width is not uniform.

R. The name of all baselines shall be shown. The pipe size and direction of flow shall be noted on all pipes, above the pipe and between all manholes.

S. The general notes and a legend of the standard symbols used throughout the plans shall be shown on the Plan Index Sheet or on the first plan sheet if the plan index is shown on the Title Sheet.

T. Stations shall be shown above each 100-foot station on 50-scale and 20- scale plans and above each 500-foot station on 100-scale plans. For example: 1+00, 5+00, etc. All horizontal curve data shall be shown on the plans, if applicable.

U. The phrase, "Do Not Disturb", shall be used to indicate existing conditions or facilities, which are to remain in place during construction. The phrase or abbreviation, "DND", shall be shown adjacent to all such items on the plans. If used, "DND" must be shown and defined in the legend. Likewise "DNR", "Do Not Remove", may be used to indicate existing conditions or facilities which are to remain in place during construction but which some level of disturbance is anticipated. The size and type of items, which are within the construction area, must be clearly identified. This information is critical to assist in the easement acquisition process.

V. The resurfacing limits will be shown for all projects receiving final resurfacing.

W. Where applicable, add the following: storm sewer pipe and PSC charts.

4.4.3 Profile View

In addition to those items listed in Section 4.4.1, the information to appear in the profile view shall include the following as a minimum:

A. Stations and grid elevations shall be shown. . The grid shall be set up on a 2-inch square basis. The vertical scale for 50-scale plans shall be 1" = 5' and for 20-scale plans shall be 1" = 2'.

B. The limits, by station, shall be shown for all concrete caps, cradles and encasements, tunnels, and bored segments.

C. When a line located in an easement crosses a public right-of-way, the limits of that right-of-way, including its width, shall be shown.

D. Information relative to whether the line will be constructed in an easement, right-of-way, or existing New Albany or Floyd County property shall be shown directly above the profile grid.

E. The type of backfill used, when not identified in the general notes, shall be placed directly above the profile grid with a leader and arrow defining the limits of each type of backfill.

F. The ASTM or AASHTO designation (whichever applies) and pipe classification shall be shown below the pipe profile.

G. The pipe size, grade, and distance between the centerline of the manholes shall be indicated between all manholes. This information shall be parallel to and shown above smaller pipes; however, on pipes of sufficient diameter, this information should be placed inside the pipe. Grades shall be shown as a percent, i.e., 0.50%.

H. Invert elevations shall be shown to the nearest hundredth of a foot and at the following locations:

1. All breaks in the grade.

2. Breaks necessary for profile continuation onto another sheet.

3. Centerline of standard manholes with continuous grade. Other conduits critical to the pipe gradient.

4. Intersecting pipe.

5. All locations necessary to substantiate the profile grade.

6. Both pipe invert edges when there is a drop or slant inlet.

7. Other conditions shown on the typical drawings.

8. Each catch basin or surface inlet connection.

9. Labeled similar to: IE 479.48.

I. Manholes shall be identified by station, line and manhole number. Proposed manhole rim elevations shall be shown to the nearest tenth (Rim El. 424.9±) in earth areas and to the nearest hundredth in paved areas. Surface inlet grates shall also be shown to the nearest hundredth (Gr. El. 418.76).

J. The water surface elevations of ponding and/or 100-year flooding areas shall be shown.

K. Borings indicating depths and type of soils encountered shall be shown if not shown on a separate soils sheet.

L. The results of all soundings shall be shown using the proper symbol.

M. The vertical height of manhole collars shall be shown.

N. The flow line of all ditches having impact on sewer depth or location which are deeper than one foot shall be plotted and labeled as flowline ditch, left or right. On large channels, it may be necessary to show left and right tops of bank.

O. Existing ground profile including street grades or other improvements shall be shown as dashed lines. Proposed ground profile, including any proposed street grades or improvements, shall be shown as a solid line. See Exhibit 4-1.

P. If basements exist, the basement floor elevation shall be shown for sanitary plans. For houses without basements, the first floor elevations shall be shown. When an existing basement floor elevation absolutely cannot be obtained, a first floor elevation shall be obtained and a basement elevation estimated. When the basement elevation is estimated, this fact shall be duly noted in the profile by using the word "Assumed" adjacent to the elevation. House numbers or lot numbers shall be indicated on the profile along with elevations indicated above.

Q. In order to show on which side of the sewer a house is located, houses on the left (when facing up station) shall be drawn using a solid line, and houses on the right (when facing up station) shall be drawn using a dashed line as shown in Exhibit 4-2.

R. Any stacks to be shown on the profile, such as for interceptor sewers, shall be shown solid on the left side and dashed on the right side and should be labeled pipe size stack and left or right.

S. Any underground telephone conduit, water lines, gas lines, etc. shall be shown when crossing proposed New Albany or Floyd County facilities.

4.4.4 Cross Sections

The information to be shown on cross-sections shall be, but not limited to, the following:

A. Horizontal and vertical scales shall be equal. Generally a scale of 1" = 5' shall be used; however, 1" = 10' may be used in special circumstances. Any other scale to be used requires prior approval of the Project Manager.

B. Pre-printed colored grid sheets shall not be used because they cannot be scanned on computer for record.

C. Cross-sections shall be required for all proposed ditch projects as well as roadway or alley construction.

D. Cross-sections should show the existing and proposed ground lines, utilities, fences, structures, property lines, easement lines, and right-of-way lines.

E. Cross-sections shall be shown looking up station and shall be placed on the sheet progressing from bottom of sheet for lower station to top of sheet for higher station and left to right if more than one row of cross-sections is presented on one sheet.

F. Cross-sections shall generally be on even 50-foot stations along the improvement centerline or baseline.

G. If cross-sections are required on a project, pipe crossings may be shown on a cross-section rather than creating a separate profile for each pipe crossing.

H. Half-sections shall be shown for all driveways and a minimum of one half-section between driveways.

I. All water lines, gas lines, telephone conduit, and others shall be shown in the cross-section.

J. Existing ground shall be shown as dashed lines and proposed grade shall be shown with solid lines.

4.4.5 General Notes

General Notes are notes common to the complete set of plans and shall be shown on the first plan sheet, if space permits, or Title Sheet, if necessary. The type of backfill, pipe material and classification may be shown in the General Notes if the majority of the pipes on a particular project have these items in common. Additionally, a Legend shall be shown on the first plan sheet, which defines the standard symbols used in the plans.

4.4.6 Certification

4.4.6.1 Surveyor’s Certification

The following certification paragraph and signature is to be placed on all sanitary and drainage projects. This note will need to be adjusted if survey procedures deviate from the language as shown.

CERTIFICATION

I hereby certify that the topography for this plan was located under my supervision, and that the property lines shown hereon were obtained from recorded deeds or plats, and that only the property corners noted as monumented were located in the field.

Surveyor's Signature, L.S. # and Date

4.4.6.2 Basement Elevation Certification (Sanitary Projects Only)

The registered Land Surveyor shall place the following certification on the preliminary plan cover sheet, or other appropriate location, prior to the request for a field review. The certification should also be placed on the first plan sheet or other appropriate location in the final plans prior to their submission to New Albany for approval.

CERTIFICATION

I hereby certify that the houses shown on these plans, which have basement facilities controlling the elevation of the sanitary sewer, have been entered and controlling elevations determined under my supervision, and that these elevations are correct to the best of my knowledge and belief.

Surveyor's Signature, L.S. # and Date

NOTE: ON SANITARY PROJECTS THE CERTIFICATIONS CAN BE COMBINED AS A SINGLE NOTE IF APPLICABLE.

4.4.6.3 Professional Engineer Certification

Plans and specifications shall be prepared by or under the personal supervision of a professional engineer, registered pursuant to IC 25-31-1. Final Plans and specifications submitted to New Albany and Floyd County as well as applicable regulatory agencies shall be certified and sealed by a professional engineer. Registered land surveyors may prepare and certify plans for sanitary sewer extensions and storm drainage only as provided in IC 25-21.5-1-7.

EXHIBIT 4-1 PAGE 1
STANDARD LAYERS

EFFECTIVE DATE: DECEMBER 2012

NAME	DESCRIPTION	COLOR	LINETYPE	LINETYPE EXAMPLES
BM	BENCH MARK	50	CONTINUOUS	
BORDER-0	BASE SHEET LAYER	12	CONTINUOUS	
BORDER-1	BASE SHEET LAYER	20	CONTINUOUS	
BORDER-2	BASE SHEET LAYER	40	CONTINUOUS	
BORDER-3	BASE SHEET LAYER	50	CONTINUOUS	
BORDER-4	BASE SHEET LAYER	150	CONTINUOUS	
BORDER-ROLL	BASE SHEET LAYER	2	CONTINUOUS	
DRNA	DRAINAGE AREA	230	HIDDEN	
E-ASPH	EXISTING ASPHALT	12	HIDDEN	
E-BASE	EXISTING BASELINE	130	CONTINUOUS	
E-BLDG	EXISTING BUILDING	32	CONTINUOUS	
E-CONC	EXISTING CONCRETE	12	HIDDEN	
E-CONT-MJR	EXISTING MAJOR CONTOUR	22	HIDDEN2	
E-CONT-MNR	EXISTING MINOR CONTOUR	12	HIDDEN2	
E-CONT-TXT	EXISTING CONTOUR TEXT (L80)	12	CONTINUOUS	
E-CRST	EXISTING CRUSHED STONE	172	HIDDEN4	
E-DTCH-E	EXISTING EARTH DITCH	102	FLOW LINES	
E-DTCH-P	EXISTING PAVED DITCH	102	DASHED2	
E-ESMNT	EXISTING EASEMENTS	102	PERM ESMT	
E-FENC	EXISTING FENCES	12	FENCE	X X
E-FLTS	EXISTING FAULTS	7	CONTINUOUS	
E-GRND	EXISTING GROUND (TOP OF BANK)	22	EXIST SHOULDER	
E-PL	EXISTING PROPERTY LINES	162	CONTINUOUS	
E-PL-CH	EXISTING PROPERTY LINE CHORD	162	HIDDEN2	
E-ROAD	EXISTING EDGE OF ROAD, PAVEMENT	162	EXIST EDGE PVMT	
E-RR	EXISTING RAILROADS	32	CONTINUOUS	
E-RW	EXISTING RIGHT OF WAY	115	RIGHT OF WAY	
E-SANI *	EXISTING SANITARY SEWERS	102	HIDDEN 2	
E-SPOT	EXISTING SPOT ELEVATION (L80)	195	CONTINUOUS	
E-STRM *	EXISTING STORM SEWERS	102	EXIST PIPE OR STRUCT	
E-STRP	EXISTING PAVEMENT STRIPING	16	CONTINUOUS	
E-TOPO	EXISTING TOPOGRAPHY	12	CONTINUOUS	
E-U-CBTV	EXISTING OVERHEAD CABLE TELEVISION	12	OHC	OHC
E-U-CBTV2	EXISTING UNDERGROUND CABLE TELEVISION	12	CABLETV	CTV
E-U-ELEC	EXISTING OVERHEAD ELECTRIC	22	OHE	OHE
E-U-ELEC2	EXISTING UNDERGROUND ELECTRIC	12	ELEC	UGE
E-U-GAS *	EXISTING GAS	92	GAS	G G
E-U-TELE	EXISTING OVERHEAD TELEPHONE	92	OHT	OHT
E-U-TELE2	EXISTING UNDERGROUND TELEPHONE	92	TELE	UGT
E-U-WATR *	EXISTING WATER	172	WATER	W W
E-VEG	EXISTING VEGETATION, TREES, SHRUBS	12	CONTINUOUS	
FILE-INFO	FILE INFORMATION	7	CONTINUOUS	
GL	GRID LINE	252	CONTINUOUS	
GT	GRID TEXT (L120)	7	CONTINUOUS	
HT	HATCH	92	CONTINUOUS	
P-ASPH	PROPOSED ASPHALT	215	CONTINUOUS	
P-ASPH-HT	PROPOSED ASPHALT HATCH PATTERN	182	CONTINUOUS	
P-BASE	PROPOSED BASELINE	230	CONTINUOUS	
P-BLDG	PROPOSED BUILDING	230	CONTINUOUS	
P-CONC	PROPOSED CONCRETE	214	CONTINUOUS	
P-CONC-HT	PROPOSED CONCRETE HATCH PATTERN	188	CONTINUOUS	

* SEE EXHIBIT 4-2 FOR ADDITIONAL EXPLANATION.

NAME	DESCRIPTION	COLOR	LINETYPE	LINETYPE EXAMPLES
P-CONT-MJR	PROPOSED MAJOR CONTOUR	210	CONTINUOUS	
P-CONT-MNR	PROPOSED MINOR CONTOUR	200	CONTINUOUS	
P-CONT-TXT	PROPOSED CONTOUR TEXT (L100)	210	CONTINUOUS	
P-CRST	PROPOSED CRUSHED STONE	213	CONTINUOUS	
P-CURB	PROPOSED CONCRETE CURB	40	CONTINUOUS	
P-DSTB	PROPOSED DISTURB LIMITS	89	DOT2	
P-DTCH-E	PROPOSED EARTH DITCH	210	FLOW LINES	
P-DTCH-P	PROPOSED PAVED DITCH	210	CONTINUOUS	
P-EPSC	PROPOSED SILT CONTROL DEVICES	50	CONTINOUS	
P-FENC	PROPOSED FENCE	210	FENCE	x x x
P-FLOW	PROPOSED DRAINAGE DIRECTIONAL FLOW ARROW	20	CONTINUOUS	
P-GRND	PROPOSED GROUND	210	CONTINUOUS	
P-PERM	PROPOSED PERMANENT EASEMENTS	210	PERM ESMT	
P-PL	PROPOSED PROPERTY LINE	245	CONTINOUS	
P-ROAD	PROPOSED EDGE OF ROAD, PAVEMENT	240	CONTINOUS	
P-RW	PROPOSED RIGHT OF WAY	233	RIGHT OF WAY	
P-SANI *	PROPOSED SANITARY SEWERS	210	CONTINUOUS	
P-SF	PROPOSED SILT FENCE \ TREE PROTECTION FENCE	50	SF	SF
P-SPOT	PROPOSED SPOT ELEVATION (L80 w/o obliquing)	40	CONTINUOUS	
P-STRM *	PROPOSED STORM SEWERS	211	CONTINUOUS	
P-STRP	PROPOSED PAVEMENT STRIPING	52	CONTINUOUS	
P-TEMP	PROPOSED TEMPORARY EASEMENT	190	TEMP ESMT	
P-U-CBTV	PROPOSED OVERHEAD CABLE TELEVISION	200	PROP OHC	OHC
P-U-CBTV2	PROPOSED UNDERGROUND CABLE TELEVISION	200	PROP UGC	UGC
P-U-ELEC	PROPOSED OVERHEAD ELECTRIC	201	PROP OHE	OHE
P-U-ELEC2	PROPOSED UNDERGROUND ELECTRIC	201	PROP UGE	UGE
P-U-GAS *	PROPOSED GAS	205	GAS	G
P-U-TELE	PROPOSED OVERHEAD TELEPHONE	203	PROP OHT	OHT
P-U-TELE2	PROPOSED UNDERGROUND TELEPHONE	203	PROP UGT	UGT
P-U-WATR *	PROPOSED WATER	200	WATER	W
P-VEG	PROPOSED VEGETATION, TREES, SHRUBS, ETC.	205	CONTINUOUS	
PAPER	PAPER	7	CONTINUOUS	
PNTS	POINTS MADE FROM LDD / CIVIL 3D	7	CONTINUOUS	
PRELIM	PRELIMINARY	7	CONTINUOUS	
SL	STATION LABELS (L140)	7	CONTINUOUS	
SNDG	ROCK SOUNDINGS	55	CONTINUOUS	
TX0	TEXT L60	12	CONTINUOUS	
TX1	TEXT L80	20	CONTINUOUS	
TX2	TEXT L100	40	CONTINUOUS	
TX3	TEXT L120	50	CONTINUOUS	
TX4	TEXT L140	70	CONTINUOUS	
TX5	TEXT L175 AND ABOVE	80	CONTINUOUS	
XREF	EXTERNAL REFERENCE	7	CONTINUOUS	

* SEE EXHIBIT 4-2 FOR ADDITIONAL EXPLANATION.

EXHIBIT 4-2

STANDARD LINETYPE EXHIBITS AND MISCELLANEOUS FEATURES

EFFECTIVE DATE: DECEMBER 2012

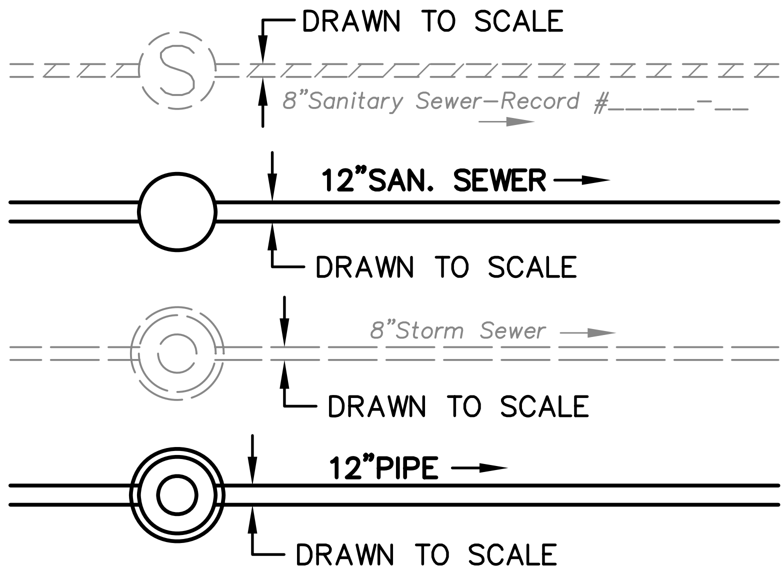
LINETYPES

EXISTING SANITARY SEWER

PROPOSED SANITARY SEWER

EXISTING STORM SEWER

PROPOSED STORM SEWER



APPLIES TO GAS AND WATER

EXISTING UTILITY UP TO 10"

EXISTING UTILITY 12"AND LARGER SHOWN WITH ACTUAL WIDTH ASSIGNED TO LINE,

MISCELLANEOUS FEATURES

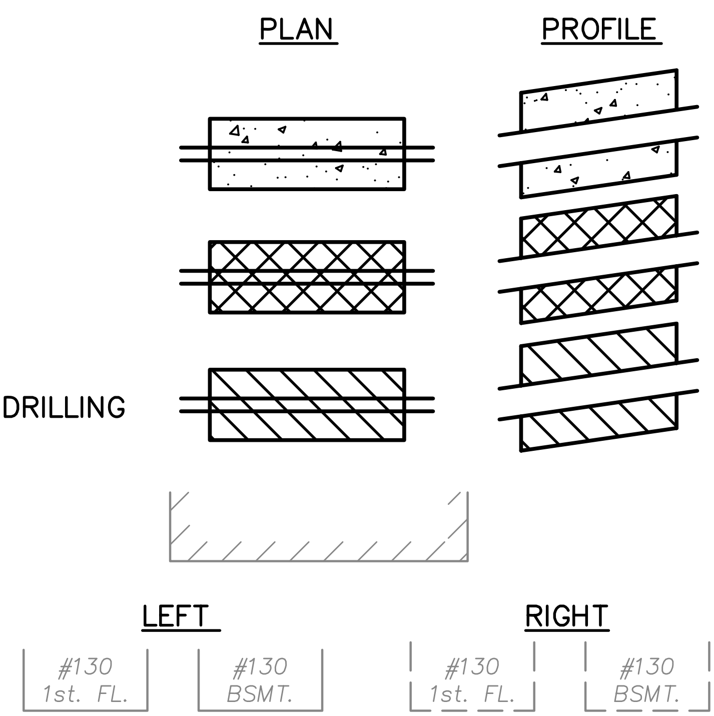
CONCRETE ENCASEMENT

TUNNELING OR PIPE JACKING

BORE & JACK OR DIRECTIONAL DRILLING

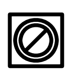
EXISTING BUILDINGS IN PLAN (FIELD LOCATED)

EX BUILDINGS IN PROFILE LEFT AND RIGHT OF BASELINE



SYMBOLS	DESCRIPTION
	*Existing Tree (with size, type & drip line diameter)** * When locating tree sizes for plan views, measure diameter of trunk at breast height (in inches) and measure actual diameter of Drip line to the nearest foot.
	Existing Pine or Spruce W/Size
	Existing Bush W/Size
Wooded Area	*Edge of Woods*
	Existing Traffic Sign
○ *MB*	*Existing Mailbox*
□ *PB*	*Existing Paperbox*
	Contract Bench Mark
	Existing Guy Anchor
	Existing Power Pole
	Existing Pole W/Light
	Existing Light Post
□ *EPED*	*Existing Electrical Pedestal*
E	*Existing Electrical Manhole*
T	*Existing Telecommunications Manhole*
□ *TPed*	*Existing Telecommunications Pedestal*
○ *CATV–PED*	*Existing Cable T.V. Pedestal*
● 437.2±	*Overhead Power Lines (Profile)*
○ *GM*	*Existing Gas Meter*
○ *GV*	*Existing Gas Valve*
○ *GLM*	*Existing Gas Line Marker*
	Existing Fire Hydrant
○ *WM*	*Existing Water Meter*
○ *WV*	*Existing Water Valve*
W	*Existing Water Manhole*
○ *WLM*	*Existing Water Line Marker*

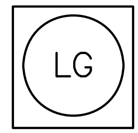
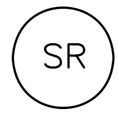
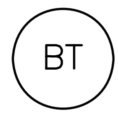
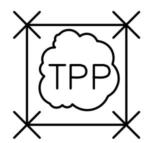
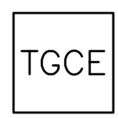
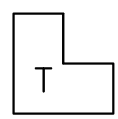
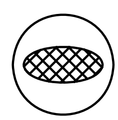
SYMBOLS	DESCRIPTION
CO	*Existing Sewer Clean–out*
S	*Existing Sanitary Manhole*
M.H.	*Existing Storm Manhole*
	Existing Catch Basin (Single)
	Existing Catch Basin (Double)
	Existing Catch Basin (Round)
Steel	*Bridge (type of bridge shall be noted)*
R.P.	*Railway Pole*
	Railroad Rails (Profile)
P.L. (PIPE)	*Existing Property Line Pipe (TYPE)*
⊠	*Right Of Way Marker*
3	*Parcel Number*
C–3	*Consent and Release Parcel Number*
S•	*Sounding Location (Plan)*
	Sounding To Rock or Refusal (Profile)
	Sounding No Rock (Profile)
● B–0	*Boring Location And Number.* *Geotechnical borings were drilled utilizing a truck–mounted drill rig. Borings were taken to a depth of one foot below flow line or until refusal.*
	PROPOSED EMBANKMENT OR EXCAVATION SLOPE
	PROPOSED STORM MANHOLE
	PROPOSED DOUBLE CURB INLET
	PROPOSED CATCH BASIN DOUBLE
	PROPOSED SANITARY MANHOLE

SYMBOLS	DESCRIPTION
	*Denotes 6" property service connection to be constructed to property or easement line as directed.*
	*Denotes 6" Y or T branch with stopper. Property service connection is not to be constructed.*
	***Denotes 6" siamese property service connection (not permitted).***
	*Denotes 6" property service connection to be constructed from stack at sewer to property or easement line as directed. (See note below)*
	*Denotes 6" Y or T branch with stopper to be constructed from stack at sewer. Property service connection is not to be constructed. (See note below)*
	*Denotes a 6" property service connection (PSC) to be constructed. The PSC is <u>not</u> available for connection until the capacity charge, applicable at the time, is paid.*

Note: The following must be added to the general notes:

All stacks must conform to the requirements of section 12.14 of the New Albany and Floyd County Stormwater and Sanitary Sewer Design Manual.

MAPPING SYMBOLS AND NOMENCLATURE FOR EROSION AND SEDIMENT CONTROL PLANS FOR LAND DISTURBING ACTIVITIES

DESCRIPTION	SYMBOL
SITE PREPARATION:	
LAND GRADING:	
SURFACE ROUGHENING:	
BULLDOZER TRACKED:	
TREE PRESERVATION AND PROTECTION:	
TEMPORARY GRAVEL CONSTRUCTION ENTRANCE/EXIT:	
BENCH TERRACING:	
TOPSOILLING:	

MAPPING SYMBOLS AND NOMENCLATURE FOR EROSION AND SEDIMENT CONTROL PLANS FOR LAND DISTURBING ACTIVITIES (CONT.)

DESCRIPTION	SYMBOL
SURFACE STABILILIZATION:	
TEMPORARY SEEDING:	TS
PERMANENT SEEDING:	PS
SODDING:	SO
MULCHING:	M
DUST CONTROL:	DC
EROSION CONTROL BLANKET:	ECB
TURF REINFORCEMENT MAT:	TRM

MAPPING SYMBOLS AND NOMENCLATURE FOR EROSION AND SEDIMENT CONTROL PLANS FOR LAND DISTURBING ACTIVITIES (CONT.)

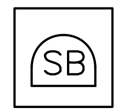
DESCRIPTION	SYMBOL
OUTLET PROTECTION:	
OUTLET STABILIZATION STRUCTURE:	OS
INLET PROTECTION:	IP
GRAVEL AND WIRE MESH INLET SEDIMENT FILTER:	GWI
FILTER FABRIC DROP INLET PROTECTION (TEMPORARY):	FDI
BLOCK AND GRAVEL INLET PROTECTION (TEMPORARY):	BGDI
STONE BAG INLET PROTECTION:	SIP
SEDIMENT TRAPS AND BARRIERS:	
TEMPORARY SEDIMENT TRAP:	TS

MAPPING SYMBOLS AND NOMENCLATURE FOR EROSION AND SEDIMENT CONTROL PLANS FOR LAND DISTURBING ACTIVITIES (CONT.)

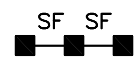
DESCRIPTION — SYMBOL

SEDIMENT TRAPS AND BARRIERS (CONT):

SEDIMENT BASIN:

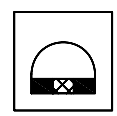


SILT FENCE (SEDIMENT FENCE):



DITCH CHECK:

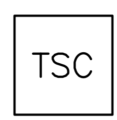
TEMPORARY SEDIMENT BASIN:



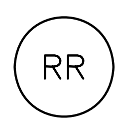
REINFORCED SILT FENCE:

STREAM PROTECTION:

TEMPORARY STREAM CROSSING:



RIPRAP:



VEGETATED FILTER STRIPS:

EXHIBIT 4-3 STANDARD SYMBOLS	PAGE 8
EFFECTIVE DATE: DECEMBER 2012	

MAPPING SYMBOLS AND NOMENCLATURE FOR EROSION AND SEDIMENT CONTROL PLANS FOR LAND DISTURBING ACTIVITIES (CONT.)

DESCRIPTION	SYMBOL
RUNOFF CONTROL MEASURES:	
PERMANENT CLEAN WATER:	→ PCW →
TEMPORARY CLEAN WATER:	→ TCW →
TEMPORARY SEDIMENT LADEN:	→ TSL →
ROCKFILL:	RF
RUNOFF CONVEYANCE MEASURES:	RCM RCM RCM
GRASS–LINED CHANNELS:	GC GC GC
SOD LINED CHANNELS:	SC SC SC
RIPRAP–LINED CHANNELS:	RRC RRC RRC
TURF REINFORCED CHANNELS:	TRC TRC TRC
PAVED CHANNELS:	PC PC PC
TEMPORARY SLOPE DRAINS:	TSD TSD TSD
PIPE SLOPE DRAINS:	PSD PSD PSD
RUNOFF CONVEYANCE MEASURES (CONT):	
STONE BAG CHECK DAM:	SBCD ▶ SBCD ▶ SBCD
OTHER RELATED PRACTICES:	
SUBSURFACE DRAIN:	SSD SSD
CONSTRUCTION DEWATERING:	

STANDARD ASSIGNMENTS

PEN SIZE	*COLOR*	*COLOR RANGE 1*	*COLOR RANGE 2*	*COLOR RANGE 3*	*COLOR RANGE 4*
0.18mm	1, 9, 250	10-19	90-99	170-179	
0.25mm	2, 251	20-29	100-109	180-189	
0.30mm	3, 252	30-39	110-119	190-199	
0.35mm	4, 253	40-49	120-129	200-209	160-169
0.50mm	5, 254	50-59	130-139	210-219	
0.60mm	6, 255	60-69	140-149	220-229	
0.70mm	7	70-79	150-159	230-239	
0.90mm	8	80-89		240-249	

SHADING

All pens in the following ranges ending with the number 2 except "2" will plot shaded as follow

COLOR	**PLOTS**
12-172	40% of black
182	6% of black
192-242	40% of black
188	2% of black
16	30% of black

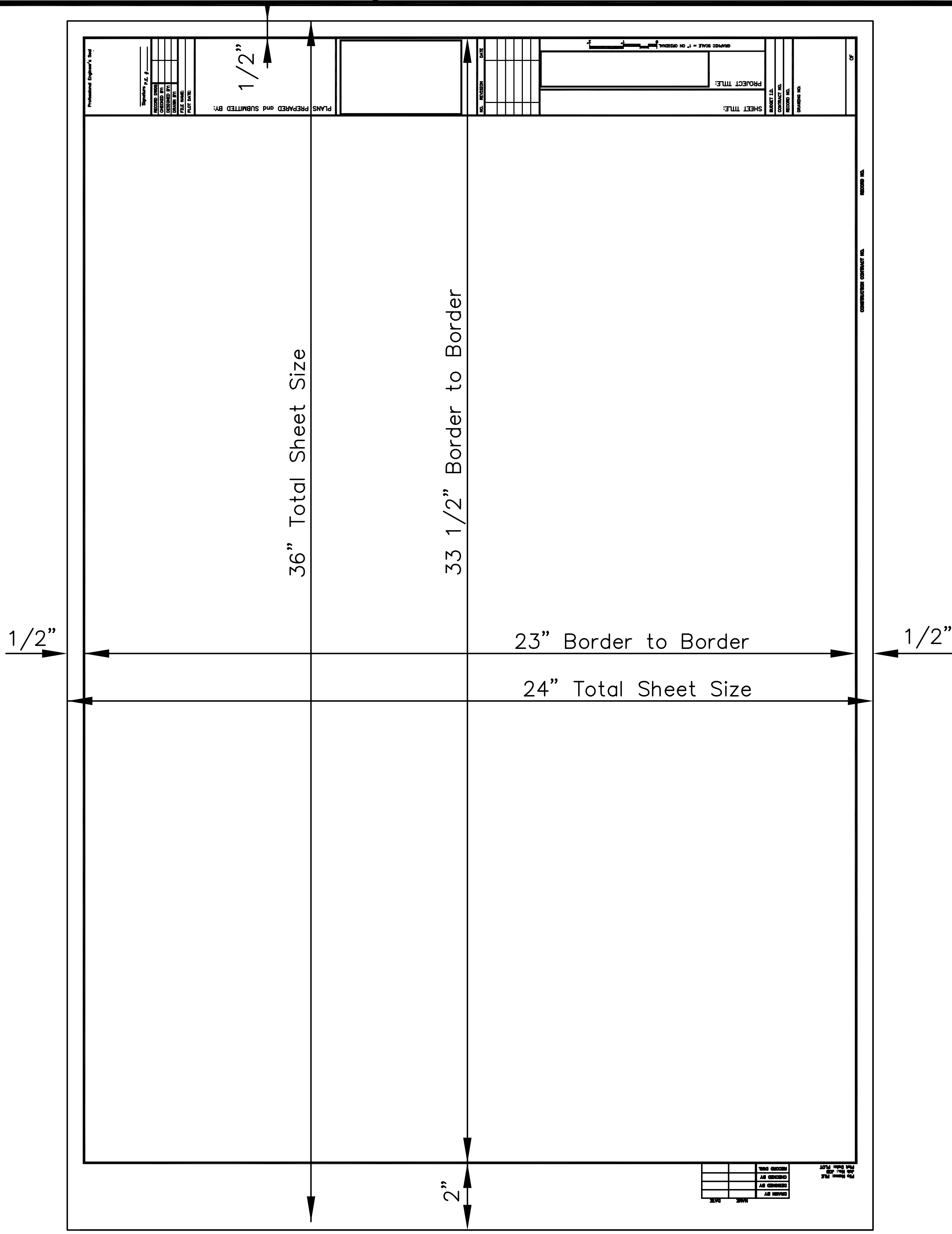
	EXHIBIT 4-5 STANDARD ABBREVIATIONS
	EFFECTIVE DATE: DECEMBER 2012

DESCRIPTION

PUE	Public Utility Easement
ATT	AT&T
Conc	Concrete
Asph	Asphalt
Culv	Culvert
Hdwl	Headwall
Hdw	Headwater
RCP	Reinforced Concrete Pipe
CMP	Corrugated Metal Pipe
CIP	Cast Iron Pipe
VCP	Vitrified Clay Pipe
PE	Polyethylene
DIP	Ductile Iron Pipe
PVC	Polyvinylchloride
HERCP	Horizontal Eliptical Reinforced Concrete Pipe
HDPE	High Density Polyethylene
HP	High Pressure
MH	Manhole
CB	Catch Basin
CI	Curb Inlet
TG	Top of Grate Elevation
I.E.	Invert Elevation
BM	Bench Mark
TBM	Temporary Bench Mark
CSB	Crushed Stone Base
R.R.	Railroad
R/W	Right-of-Way
DND	Do Not Disturb
DNR	Do Not Remove
TBR	To Be Removed
TYP.	Typical

EXHIBIT 4-6
STANDARD BORDER

EFFECTIVE DATE: DECEMBER 2012



SHEET TITLE:

PROJECT TITLE:

SAMPLE DRAWINGS

GRAPHIC SCALE = 1" ON ORIGINAL 0 1" 2"

TITLE BLOCK

DESIGN
APPROVED: ______________________________

APPROVED FOR
CONSTRUCTION: ______________________________
DIRECTOR OF ENGINEERING DATE

APPROVAL BLOCK

NO.	REVISION	DATE

REVISION BLOCK

EXHIBIT 4-8
STANDARD TITLE SHEET

EFFECTIVE DATE: DECEMBER 2012

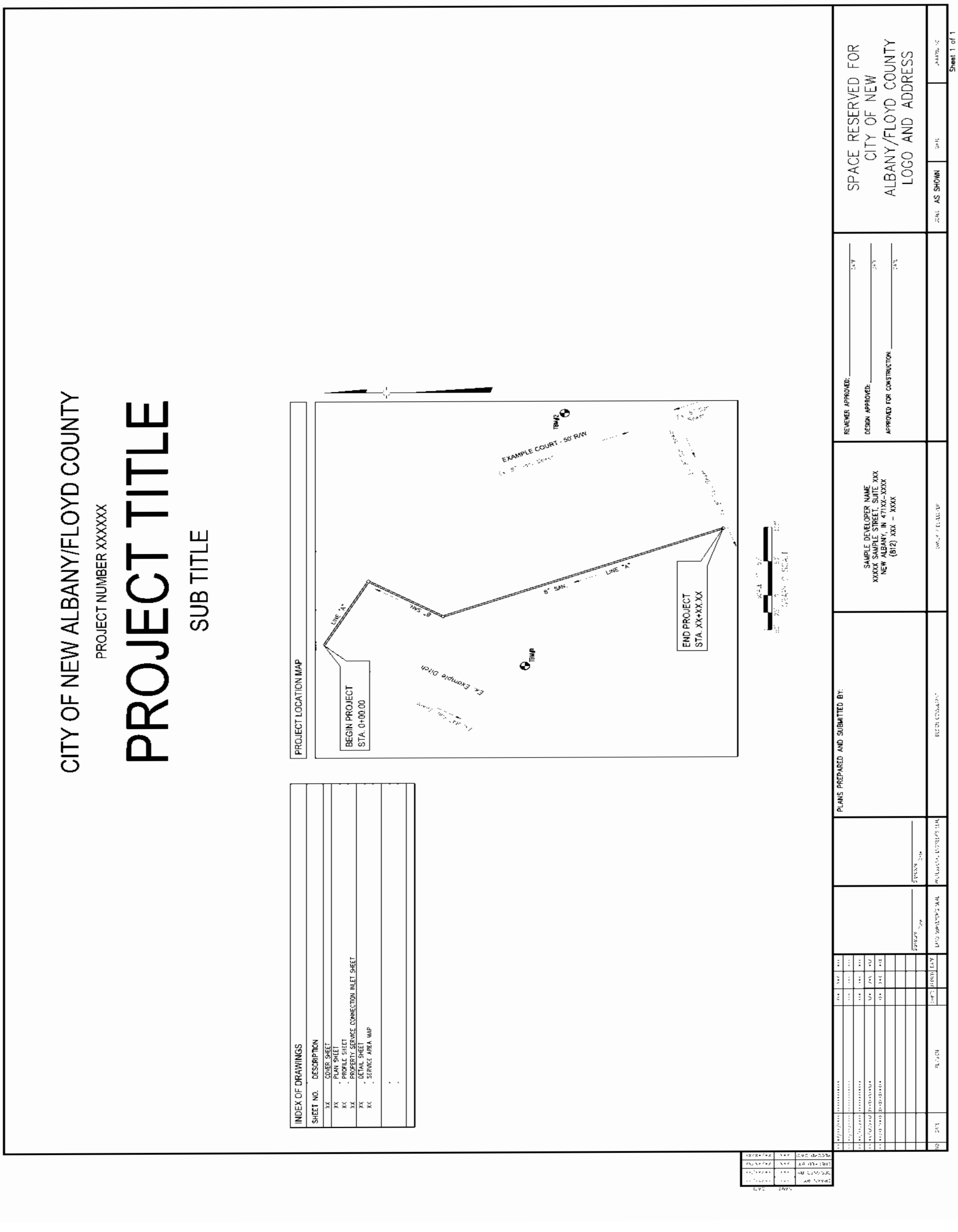


EXHIBIT 4-9
SAMPLE PLAN INDEX SHEET

EFFECTIVE DATE: DECEMBER 2012

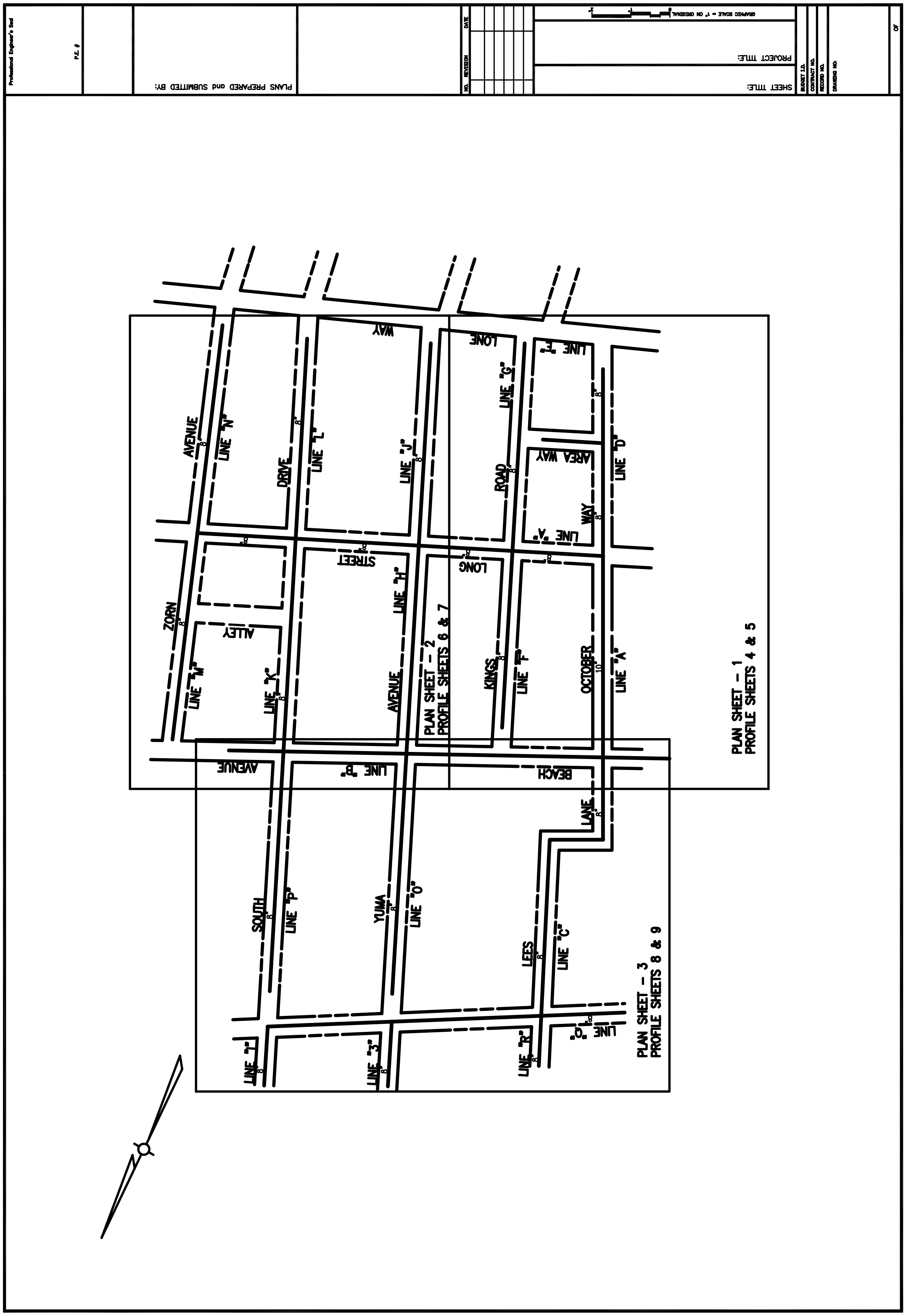


EXHIBIT 4-10
SAMPLE DRAINAGE MAP
(SANITARY COLLECTOR SYSTEM)

EFFECTIVE DATE: DECEMBER 2012

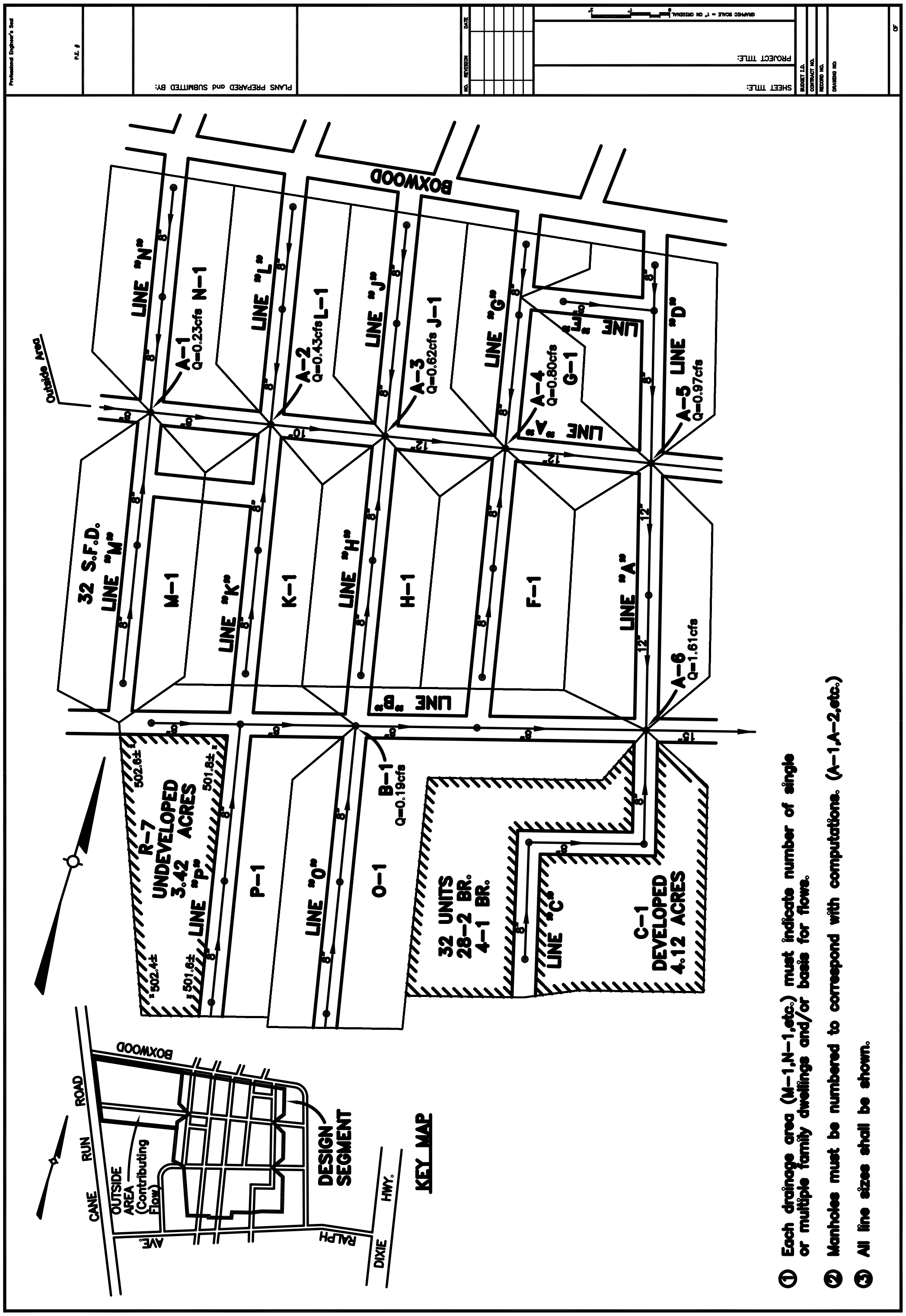


EXHIBIT 4-11
SAMPLE DRAINAGE MAP
(STORM COLLECTOR SYSTEM)

EFFECTIVE DATE: DECEMBER 2012

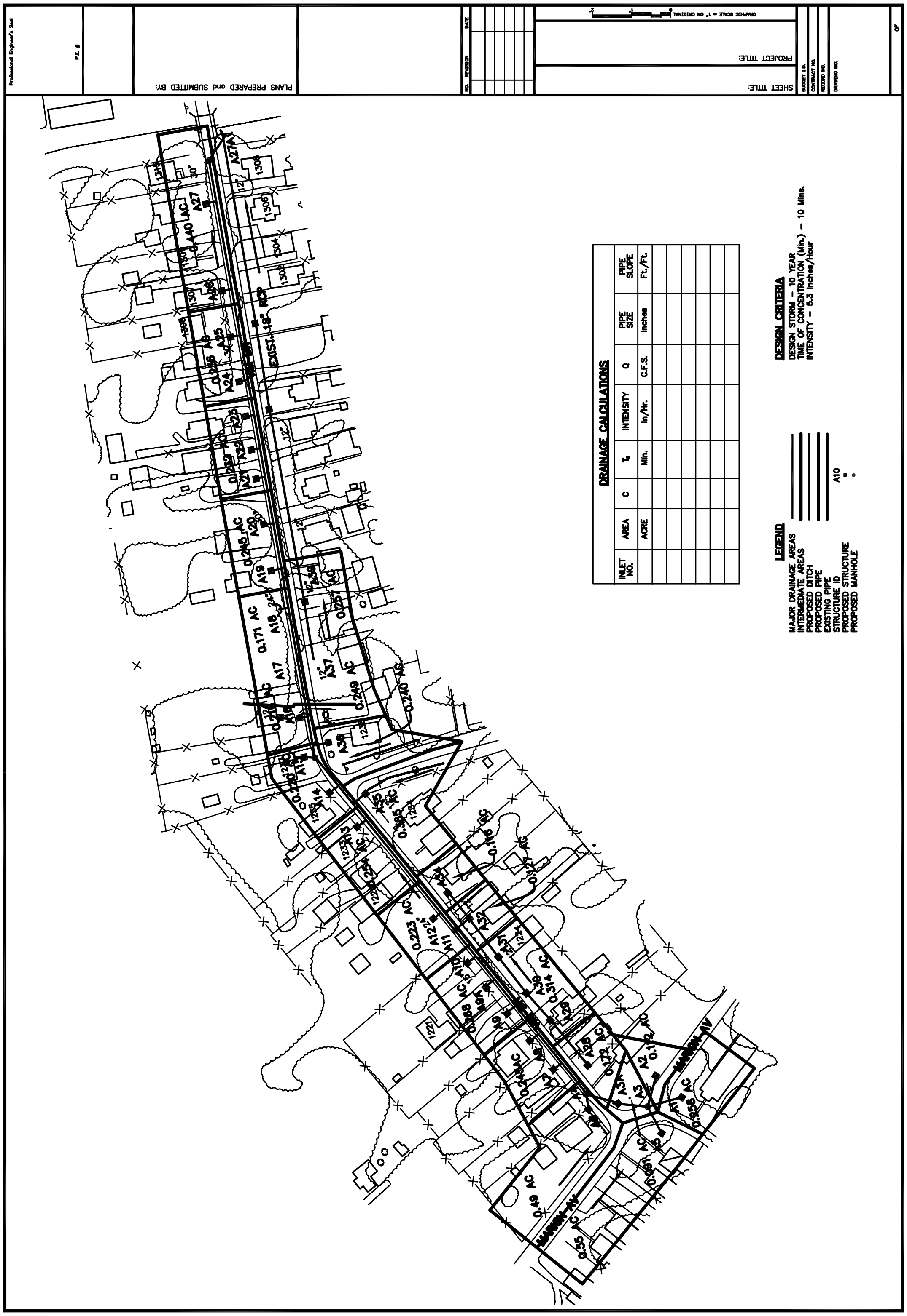


EXHIBIT 4-12
HORIZONTAL & VERTICAL
CONTROL MAP

EFFECTIVE DATE: DECEMER 2012

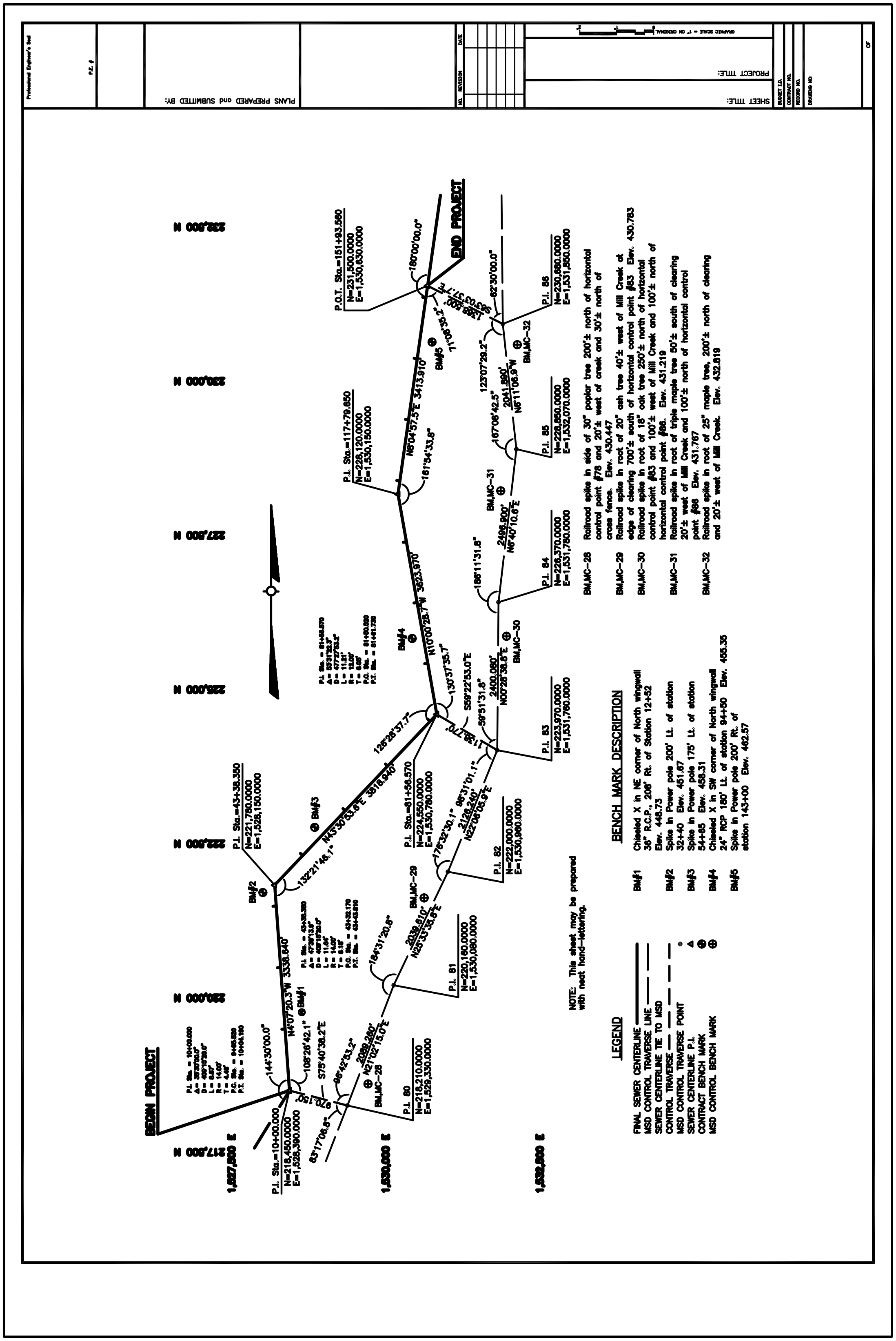


EXHIBIT 4-13
SAMPLE PLAN SHEET

EFFECTIVE DATE: DECEMBER 2012

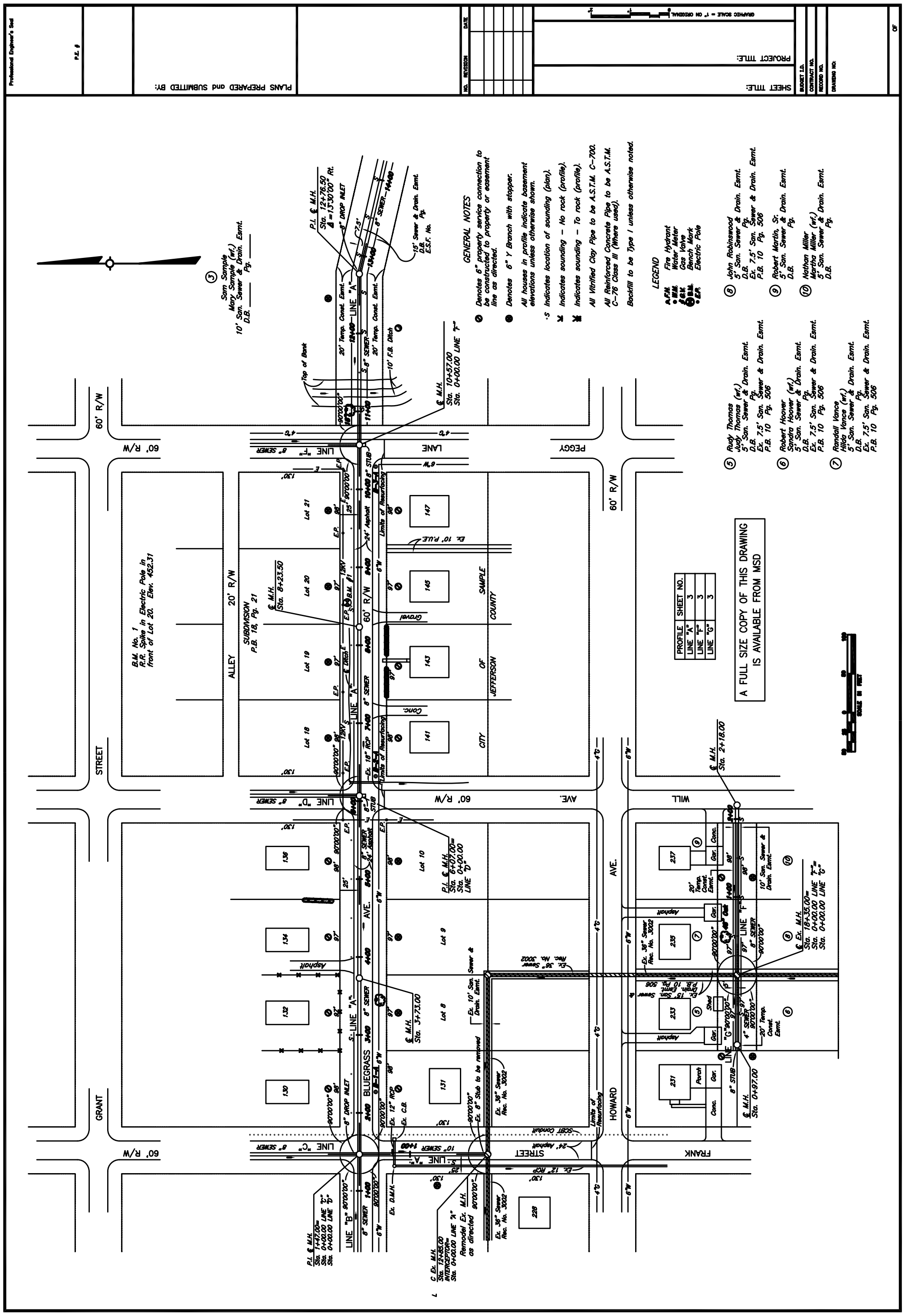


EXHIBIT 4-14
SAMPLE PROFILE SHEET

EFFECTIVE DATE: DECEMBER 2012

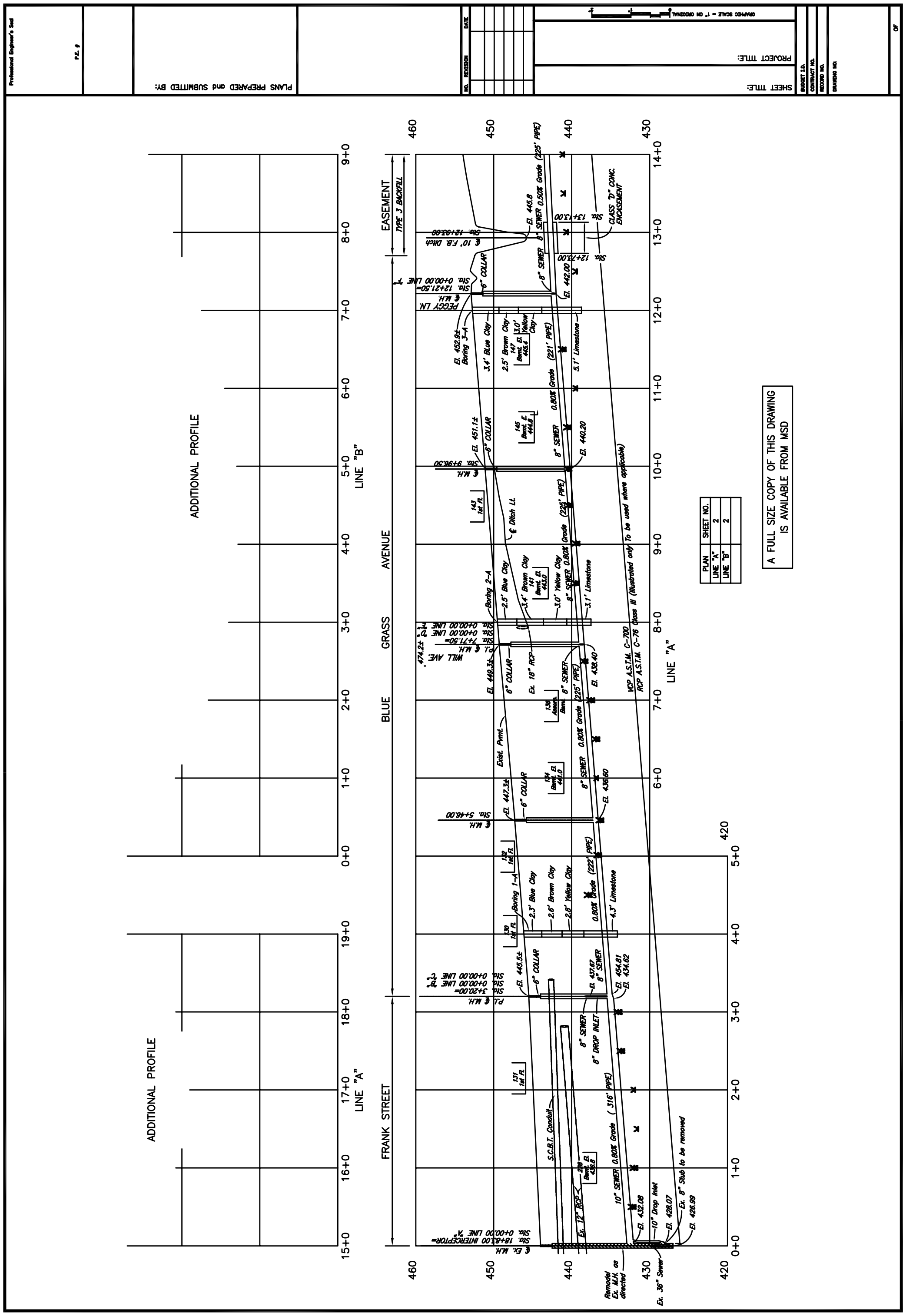


EXHIBIT 4-15
SAMPLE CROSS SECTION

EFFECTIVE DATE: DECEMBER 2012

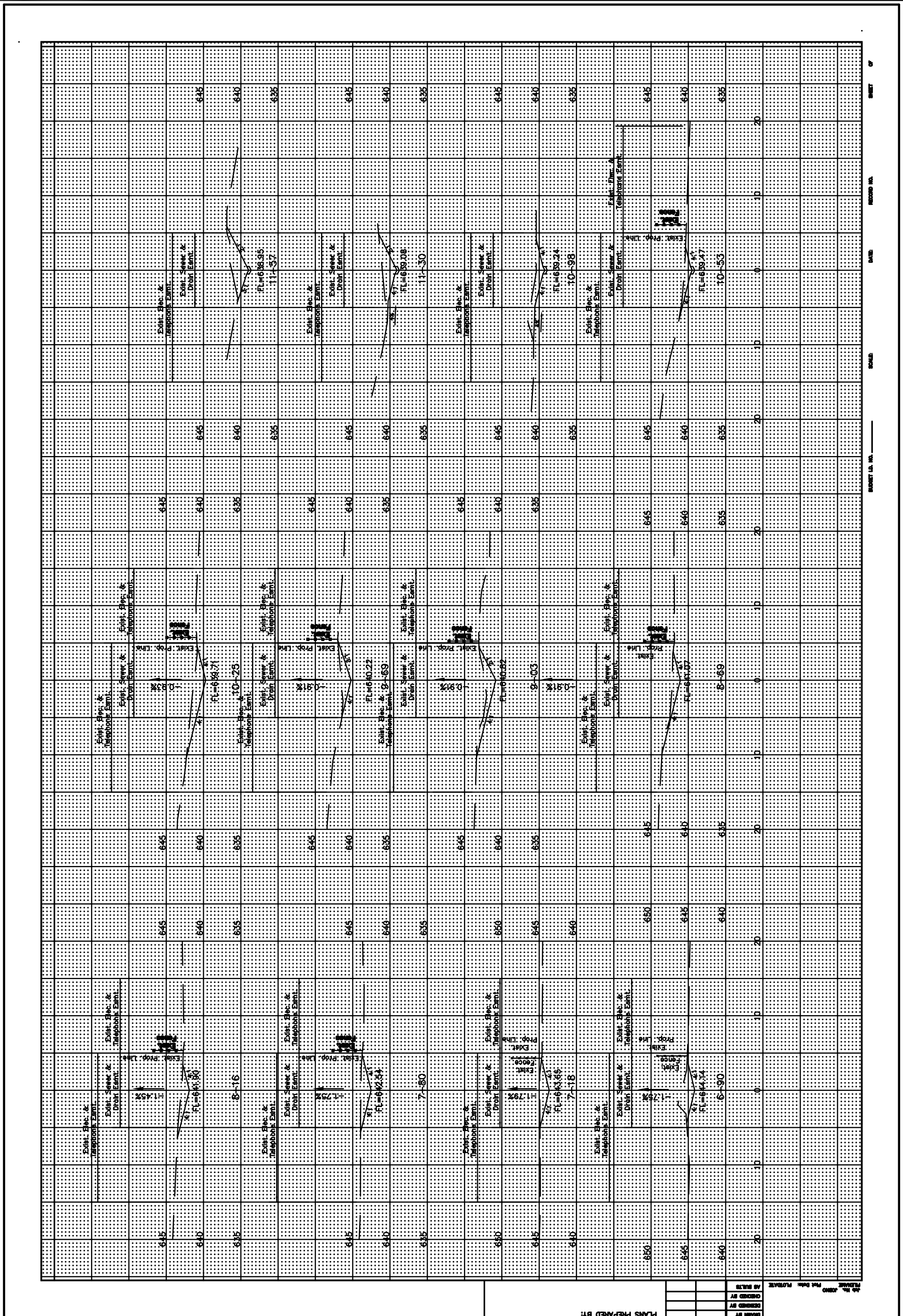


EXHIBIT 4-16
PROPERTY ACQUISITION
SUMMARY SHEET

EFFECTIVE DATE: DECEMBER 2012

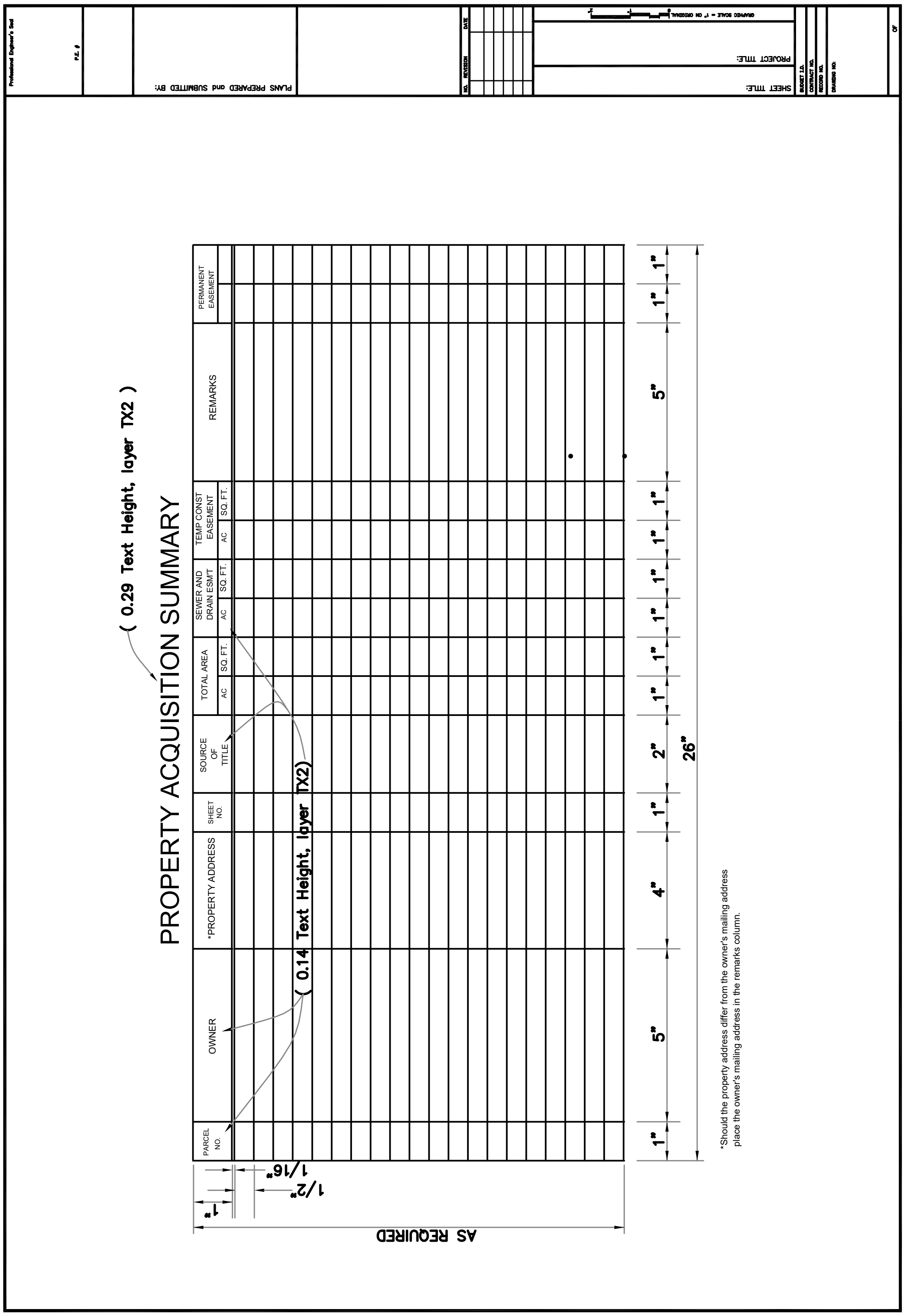


TABLE OF CONTENTS

CHAPTER 5
FINAL RECORD DRAWINGS

CHAPTER 5
FINAL RECORD DRAWINGS

5.1 PURPOSE

This chapter establishes the procedures that must be followed by Design Engineers, Land Surveyors, Contractors, and Developers concerning Final Record Drawings to ensure that all proposed sanitary sewer and stormwater drainage plans correctly depict the facilities as constructed. The final record drawings are the "Bid Plans" that have been revised to identify changes that occurred during construction. This chapter applies to capital improvement and private development projects in New Albany and Floyd County.

5.2 GENERAL

The Final Record Drawings shall be prepared by the project design engineer/consultant, based on record information provided by the contractor. At the completion of the project, the contractor will be responsible for providing New Albany or Floyd County and the design engineer/consultant with a set of "Red Line Drawings" and "As-Built Survey Information". The information will be incorporated into the "Bid Plans" design AutoCAD files by the project design engineer/consultant to become the "Final Record Drawings" file. The Final Record Drawings are then saved in AutoCAD and PDF formats, with the file name format in accordance with the requirements of Chapter 4. The file will contain a "FRD" reference, differentiating it from the original "bid plans" file. In addition to submitting the Final Record Drawings in AutoCAD and PDF formats, the project design engineer/consultant shall submit two hard copies of the Final Record Drawings to New Albany or Floyd County.

Note - On private development projects, the project owner will be responsible for preparing the Final Record Drawings, subject to the same above requirements.

On New Albany wastewater projects, the contractor must submit an excel spreadsheet containing sewer and structure as-built attribute information using the template shown in Appendix D. The excel spreadsheet is available for download on New Albany's website:

http://www.cityofnewalbany.com

In addition, it is preferable that the contractor also provides an ESRI geodatabase (shapefile) containing the attribute information shown on the template in Appendix D or an AutoCAD MAP file containing the required attribute information.

A. Construction Field Changes

Major deviations from the approved construction plans as a result of unexpected field conditions will require documentation and approval by New Albany or Floyd County and the project design engineer/consultant prior to execution of the changes. It shall be up to the New Albany or Floyd County inspector to determine if the deviation is minor and can be resolved on-site or if the deviation requires additional review and approval. If the inspector decides that the deviation needs to be reviewed by New Albany or Floyd County and/or the design engineer, then the contractor shall submit four (4) copies of the marked-up (red line) plans showing the proposed revisions. Upon acceptance of the changes, New Albany or Floyd County will mark the red line drawings approved, sign and date the approval and send the red line drawings to the construction site via the inspector. One copy will be for the contractor, one copy for the inspector, one copy for the design engineer/consultant, and one copy for New Albany or Floyd County's file. In the event that an inspector is not assigned to a project, then the contractor shall submit red line drawings for all deviations that occur from the construction plans.

B. Red Line Drawings

As the project progresses, the Contractor shall maintain a record of all deviations in location or elevation of any installation from that shown on the Plans. The information will be compiled in a red-lined format on a copy of the Bid Plans. At the completion of the project the information is submitted to New Albany or Floyd County and the project design engineer/consultant. The information should be recorded in a clear and concise format, allowing for an easy transfer of information.

C. As-Built Survey Information

The Contractor's Licensed Professional Land Surveyor will be responsible for "as-builting" the items listed below. The survey information shall be compiled in an electronic file, compatible with the *.dwg format. Location and elevations shall be tied to the project survey control.

5.3 PROCESS

On New Albany or Floyd County projects, the noted as-built information will be provided to New Albany or Floyd County as soon as possible after completion of the project. Final payment to the contractor will not occur until the as-built information is provided (this includes the attribute table, shapefile, or AutoCAD MAP file for New Albany wastewater projects).

On private development projects, final project acceptance will not occur until the completed Final Record Drawings are reviewed by New Albany or Floyd County's inspector for verification of information (this includes the attribute table, shapefile, or AutoCAD MAP file for New Albany wastewater projects). Once verified, the plans are returned to New Albany or Floyd County for final review and acceptance. If the plans are accepted they become Final Record Drawings. If they are rejected the above process is repeated until accepted.

Reference is made to Chapter 4 for a detailed explanation of the documentation requirements. The as-built information is assigned to a specific layer within the drawing file. Predetermined font and pen sizes have also been established.

5.4 DRAWING INFORMATION

Where constructed information differs from the bid information, the plans will reflect a line through the bid information and show the corrected information near the crossed-out original data. Original information shall under no circumstances be removed from the original plans. No red line markings will be accepted. A check mark should be placed beside the original plan information, which has been verified to be correct as constructed. New Albany and Floyd County will not accept Final Record Drawings that have color ink other than black or have plan information overlayed on aerial photos.

5.5 AS-BUILT ITEMS

The following construction items, at a minimum, should be reviewed and verified to produce the Final Record Drawings:

5.5.1 Alignment Changes

5.5.1.1 Changes in Location

A. Manholes

B. Catch Basins or Surface Inlets

C. Headwalls

D. Retaining Walls

E. Slope Protection

F. Channel Linings

G. Pump Station Wet Wells

H. Pump Station Valve Vaults

I. Air Release Valves

J. Property Service Cleanouts

K. Detention Basins

5.5.1.2 Changes in Elevation

To the nearest hundredth.

A. Inverts

B. Rims

C. Surface Inlet Grates

D. Paved Ditches

To the nearest tenth.

A. Turf Ditches

B. Miscellaneous Structures

C. Detention Basins

5.5.2 Structure Changes

5.5.2.1 General

A. Manhole collar sizes

B. All revisions in pipe sizes, lengths, slopes, and angles

C. Identify pipe material if different from the plans

5.5.2.2 Pump Stations

A. All revisions in pipe sizes

B. All revisions to electrical controls

C. All revisions to exhaust and ventilation systems

D. Pump modifications

E. Changes in elevation for inverts and level controls

F. Equipment layout modifications

G. Building modifications

5.5.3 Miscellaneous Changes

5.5.3.1 Property Service Connections

A. Size

B. Length

C. Depth at R/W or Property Line

D. Sewer Station

E. End Location, if the PSC is not perpendicular to the sewer

5.5.3.2 Changes in Lot or Unit Designations

A. Lot Numbers

B. Tract Numbers

C. Apartment Unit Designations

D. Condominium Unit Designations

E. Patio Home Designations

5.5.4 General

A. Any unverified data shall show +/- thereby indicating that information has not been verified.

B. The following stamp will be inserted into each plan sheet after all as-built information has been added.

Final Record Drawing
By____________________ **Date**________
Contractor______________________________________
Engineer ______________________________________

Record Drawings have been prepared based on information provided by the Contractor in accordance with the specifications.

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SURVEYING

6.1 PURPOSE

This chapter describes the various field surveys for design, construction and approvals required for capital projects. Private development requiring approval and/or acceptance of constructed facilities shall also follow these guidelines. Project engineers and field survey crew chiefs should familiarize themselves with this and all other chapters of this Design Manual prior to the start-up of any field survey effort. Familiarity with this Manual will enable the field survey crew to obtain the necessary field information for design and construction and also minimize the occurrence of improper activities.

6.2 GENERAL

6.2.1 Conduct

The survey crews shall conduct themselves properly, both on the project and in the surrounding community. Survey vehicles should be adequately identified with their corresponding firm name.

Their work should be explained to the property owners and to the public, as necessary, but the survey crew should carefully refrain from outlining any plans or policies, which might be misconstrued. If approached, the survey crew should not convey any project specific information to the property owners. The property owner should be referred to the Stormwater or Sewer Utility Manager for answers to project specific questions. The crew must be courteous at all times when talking with the public and the crew members must maintain a written record of the names of owners or residents with whom they converse. During these conversations, the survey crews should inquire about the location of survey corners or monuments located on the owner's property.

6.2.2 Right of Entry

When it is obvious that the survey work will require entry onto private property, the owner shall be contacted, the survey work described, and permission to enter obtained. No project specific information should be conveyed to the property owner. Efforts to contact property owners shall include telephone calls, letters and a door hanger for those who are not at home. It should be explained in the notice that field inspection and soils investigation personnel might require entry from time to time during the course of the project. In the event that the owner does not grant permission and it is evident that the survey work will be delayed, the Stormwater or Sewer Utility Manager should be immediately notified in writing. It is the responsibility of the Stormwater or Sewer Utility Manager to take action to obtain legal right of entry.

6.3 HORIZONTAL AND VERTICAL CONTROL

6.3.1 General

Existing horizontal and vertical control monuments in the area of the survey shall be referenced for all centerlines, and/or baselines, and level circuits. These monuments or benchmarks shall be shown and identified on the plans.

Trees are not to be used for surveying purposes except in remote areas where there is no other practical alternative. No spikes or nails are to be driven into a tree as described previously. Trees shall not be "blazed" under any circumstances, and only water-based paint may be used if it is necessary to mark a tree.

6.3.2 Datum

All control shall be related to existing monuments that have been published by NGS or the State Plane Coordinate System and must reference the appropriate datum as indicated below:

A. Horizontal control shall be referenced to the Indiana State Plane Coordinate System, East Zone 1983 (NAD83).

B. Vertical control shall be referenced to the North American Vertical Datum 1988 (NAVD 88).

6.3.3 Placement

All horizontal control shall be located within the easement or public right-of-way whenever possible. Each monument should be placed to avoid movement caused by construction or other activities. Every horizontal control marker that is not being specifically set for individual project control points should be set at maximum intervals of one-half mile on all projects.

A vertical control marker that is not being specifically set for individual project control points should be placed similarly to horizontal control marker at maximum intervals of one-quarter mile.

6.3.4 Monuments

All horizontal and vertical control markers shall be of ferrous materials a minimum of 2 inch diameter with an X stamped in the center and SURVEY MARK stamped above the X and DO NOT DISTURB stamped below the X.

6.3.5 Project Control and Bench Marks

Project horizontal control shall be as described in this chapter.

Project vertical control (bench marks) shall be established at a maximum interval of 500 feet and must maintain a minimum distance of 25 feet from the improvement centerline. Each bench mark should be placed to avoid movement caused by construction or other activities.

All bench marks must conform to specifications for quality as referenced in Federal Geodetic Data Committee (FGDC) endorsed standards FGDC-STD007.4. Sidewalks, steps (unless massive), small concrete slabs and similar structures are not acceptable. Each project must contain at least one bench mark, which conforms to Federal Geodetic Data Committee (FGDC) endorsed standards FGDC-STD-007.4.

6.3.6 Survey Control Point References

With the advent of GPS and the coordinate control capabilities of most survey equipment, field references for horizontal survey control points are no longer required.

All bench marks are to be field located and shall be referenced to the centerline of the sewer by station, and offset. In addition, other field references, such as addresses, etc., should be referenced in field notes, plans, and any other pertinent documents submitted. If a spike in a power pole is used as a benchmark, the field notes, plan sheets, and the horizontal and vertical control sheet shall list the power pole number.

6.3.7 Vandalized Survey Project Points and Bench Marks

It is not the responsibility of New Albany or Floyd County for any damage done to project centerline control points and bench marks until after the final plans, contract documents, and field notes with proper references have been accepted. Any damage done to those points up to that time will be repaired or replaced by the Land Surveyor at the Land Surveyor's expense. It is advised that these points are accurately field referenced at the earliest possible time.

6.3.8 Horizontal and Vertical Control Review

New Albany and Floyd County retains the right to request any corresponding field notes either digital or hard copies that pertain to the horizontal and vertical control for the project together with horizontal and vertical closure statements for their review.

The control data sheets shall be submitted for each newly set horizontal and vertical control monument.

6.3.9 Horizontal and Vertical Control Map

A horizontal and vertical control map is required for all sanitary sewer surveys and major storm drainage projects. This map shall be prepared on a standard plan sheet and shall be included in the final plans. The final horizontal and vertical control map shall include final stations, station equations, all curve data, and the final location and description of bench marks. In addition, the following information shall be shown.

6.3.9.1 Horizontal Information

A. Coordinate ties with adjacent projects.

B. Final coordinates of all horizontal control points, PI's, beginning and ending stations.

C. All bearings, coordinates, angles and point designations on baselines in the design segment.

D. Source of horizontal datum. (List the bearing and distance of the control line, and the deflection angle of the proposed centerline.)

6.3.9.2 Vertical Information

A. New bench marks - their designations, locations, description and elevation.

B. Existing Vertical Control Monuments - their designations, elevation and location.

C. Source of vertical datum. (If a spike in a power pole is used for a bench mark, list the power pole number and the height of the spike above the ground, and house number(s) of adjacent homes.

6.3.10 Guidelines

Horizontal and vertical control shall be established according to the guidelines defined by these publications:

A. Federal Geodetic Data Committee (FGDC) endorsed standards FGDC-STD-003, FGDC-STD-007.1 through FGDC-STD-007.4 or the current Federal Geodetic Data Committee standards.

6.4 DEGREE OF ACCURACY

6.4.1 General

The instruments used shall meet the specifications indicated in these guidelines or in following sections. All instruments shall be certified to National Institute of

Standards and Technology (NIST) standards and manufacturer's specifications. NIST, the instrument manufacturer, or a certified instrument repairs facility must perform the certification.

All instruments should be serviced regularly by a certified repair facility and checked at a National Geodetic Survey baseline. EDM instruments should be calibrated by a certified repair facility annually. Field notes of all calibration checks can be requested by New Albany or Floyd County.

Instrumentation for second order leveling as defined by the Federal Geodetic Control Subcommittee (FGCS) of the FGDC shall be used for any projects requiring second order, class II specifications.

6.4.2 Accuracy Criteria

6.4.2.1 Sanitary Interceptor or Through Drainage System

Horizontal surveys will adhere to Second Order, Class II specifications, except that the error of closure shall equal or exceed 1:50,000.

Vertical control will adhere to Second Order, Class II specifications.

6.4.2.2 Sanitary Collector or Local Drainage Systems

Horizontal surveys will adhere to Third Order, Class I specifications, except the adjustments being made by either the Least Squares or Compass Rule Method.

Vertical control will adhere to Third Order specifications, except the error of closure will be equal to or exceed Second Order, Class II requirements.

6.5 FIELD PROFILE AND TOPOGRAPHY

6.5.1 Field Profile Requirements

Profile elevations shall be determined along sanitary sewer or through drainage system centerlines at 25-foot intervals, where possible, or at 50-foot intervals on paved streets, and at all necessary intermediate breaks. Profiles shall delineate existing structures, roads, streams, etc. Elevations shall be established to the nearest one-tenth of a foot on natural terrain and to one-hundredth of a foot on artificial surfaces. Cross-sections shall be taken at critical locations when it is necessary to determine what effect open cuts or trenching might have on other facilities such as structures, utilities, pavements, fences, trees, or landscaping.

Roadside ditches within 30 feet, parallel to the sewer, and greater than 1.5 feet in depth shall be shown in profile with the sewer. These ditches and other elevations critical to design and/or construction must be shown on the plans.

6.5.2 Sanitary Service Connection Survey

A sanitary service connection survey shall be made along each street to properly determine the controlling elevations for design of a particular sanitary sewer line. The form found in Exhibit 6-1 shall be used in accomplishing this survey. The following information shall be shown on the form for each unit surveyed:

A. Type of structure.

B. Basement facilities present.

C. Size, type and location of service line.

D. Elevation of the lowest possible living area floor.

E. Any additional information that may be required for design of the sanitary sewer line.

All elevations should be determined by actual field measurements; however, if a unit cannot be entered, an estimated lowest living area floor elevation shall be made from a known elevation from some other point on the unit. In this case, the elevation must be clearly marked as being estimated. Should an estimated elevation control or have the potential to control the vertical elevation of the sewer, New Albany or Floyd County shall arrange provision for entry and actual determination of the service elevation.

The completed forms shall be submitted along with the preliminary plans for review. They need not be included in the final plan submission but shall be included with the as built drawings submitted at the conclusion of the project.

6.5.3 Topographic Requirements

The following information shall be obtained in the field:

A. All topography critical to the design of the improvement shall be located and recorded in the field notes.

B. Topography generated from aerial photography shall be identified and field checked for any errors or omissions. Omitted topography shall be located by field survey and appropriately recorded. This work is the specific responsibility of the Engineer or Land Surveyor, even though the aerial photography may have been provided from other sources. All topography within the project construction limits and/or easements and rights-of-way shall be field located.

6.5.4 Survey Information Needed for Trees

A. Species of Tree (Use the Audubon Society Field Guide to North American Trees, Eastern Region).

B. Size (DBH - Diameter at Breast Height).

C. Dripline (Diameter).

D. Encroachment Allowed within the Dripline.

E. Location:

1. All trees 6 inches in diameter or greater within the temporary or permanent easement shall be located and the species given within 30-feet of the centerline for pipe projects or 15 feet outside the top of slope for ditches.

2. All trees less than 6 inches in diameter shall be located and species given, when within an existing or proposed sewer and drainage easement.

3. When trees are grouped together, at a very close interval, locate the approximate center of the grouping and list the most dominant species of the group.

6.6 SPECIAL SURVEYS

6.6.1 Property Surveys

Where the relationship of the improvement location and adjacent property line is critical, the location of existing property lines and other boundaries shall be established by a property survey sufficient to define the easement. Property lines, boundary lines, easements, etc. shall be referenced by stations and offsets from the centerline or baseline to the nearest one-hundredth of one foot, by measurement of the angles at the PI with the centerline, and by other means of comparable accuracy. Surveys shall ascertain the names of owners, lessees or tenants, sources of title and date of acquisition and shall be verified from the appropriate New Albany or Floyd County records.

6.6.2 Utility Surveys

All publicly and privately-owned surface and subsurface utilities affected by the proposed improvement shall be located and identified by field survey and by use of maps supplied by the utilities. Locations, elevations, and other pertinent data as may be required for possible relocation or adjustment shall be secured for all such utilities to the limits of information currently available. Overhead power lines near the intended improvement alignment, or those which may be a construction hazard, should be shown on the plans using the proper symbol and labeled with their primary voltage.

6.6.3 Railroad and Highway Surveys

When the centerline of improvements crosses a railroad or highway, all existing and proposed railroad tracks, roadways, and affected structures shall be tied to the improvement centerline. The topography shall be provided on either side of the proposed crossing to the extent required by the affected reviewing agency. An attempt to contact the railroad owners shall be made prior to the survey work in the railroad R/W. Typical information shall include, but not be limited to, the following sections.

6.6.3.1 Railroads

A. Top of rails - 300 feet minimum in either direction locate horizontally and vertically at 50-foot intervals.

B. Angle between centerline of tracks and centerline of improvement.

C. Name and address of railroad company.

D. Location of railroad right-of-way and easements (source of record where possible).

E. Horizontal and vertical information relative to transmission lines, such as telephone or electric.

F. Stations on the centerline of each track.

G. Mile post locations, measured from centerline crossing.

6.6.3.2 Highways

A. Station on centerline of highway and each edge of pavement, or front face of curb, as may be appropriate.

B. Angle between highway centerline and centerline of improvement.

C. Location of highway rights-of-way and easements (source of record where possible).

D. Location of any crossings, parallel utilities, or drainage structures, which may be in conflict with the improvement construction.

E. Number and width of lanes and the type and condition of the surface.

6.7 STAKING SANITARY SEWER AND THROUGH DRAINAGE SYSTEM CENTERLINES

6.7.1 Preliminary Centerlines

Improvement centerlines shall be staked for a preliminary field review by using highly visible temporary markers. These markers shall be placed on the centerline at convenient locations, such as fence lines, streets, and borders of timber areas. Intermediate markers shall be placed as necessary to maintain continuous visibility. Plastic flagging shall be used on the markers to increase their visibility. Approximate stations and line designation shall be placed on the markers. The method of designating the centerline in urban areas may be modified as required to provide the information previously noted, including the use of paint on streets. Final staking of improvement lines and the assignment of final line designations before a preliminary field review is not encouraged. These requirements are subject to revision by New Albany/Floyd County to suit specific projects.

6.7.2 Final Centerlines

6.7.2.1 Staking

Prior to acceptance of the final plans, the centerline shall be staked at PI's and as needed to maintain line of sight for purposes of easement acquisition, bidding, field reviews, etc. Stations and line designation shall be clearly marked with an indelible marker on 1" x 2" x 18" (minimum) flat stake adjacent to the PI. Guard stakes of 1" x 1" x 48" (minimum), marked "Centerline Sewer" shall be provided at all PI's, manholes, structures, and other control points.

Stake markings shall include the designation of the sewer, such as Line "A” and the station of the point for which the guard stake is provided.

Points in pavement areas shall be identified by painting the necessary information adjacent to the permanently located point. PK nails or spikes are to be used for final centerline staking. Where necessary, offset stakes shall be utilized to identify points in streets, highways, and railroads.

6.7.2.2 Monuments

Iron pins shall be placed at all PI's and POT's necessary to establish the centerline, beginning and ending stations of the contract, and at those points specifically requested by New Albany/Floyd County. These points shall be field referenced, per this design manual specifications, so they may be located or reestablished at a later date. Iron pins shall be placed at all other manhole locations but do not need to be field referenced. Iron pins shall be made of or contain ferrous material and be a minimum of 30 inches in length and 5/8 inches in diameter. In lieu of iron pins, railroad spikes, 6 inches minimum length, or PK nails shall be used in bituminous pavements and a scribed cross ("X") shall be used on concrete surfaces.

6.7.2.3 Centerline Verification

The Design Consultant shall verify the improvement alignment by obtaining field angles and distances along all segments of the improvement centerline. This shall include tying the final centerline alignment by traverse into the control baseline. The alignment shown on the Horizontal and Vertical Control Map shall be the final approved alignment.

6.7.2.4 Acceptance

The Design Consultant shall verify, in writing, that the alignment shown on the final construction plans has been located correctly in the field. This shall include returning to the field and verifying that all permanent points are intact and reestablishing all damaged or missing points. This must be accomplished before New Albany/Floyd County will accept the original drawings, contract documents, and authorize final payment to the Design Engineer.

6.8 CERTIFICATION NOTES

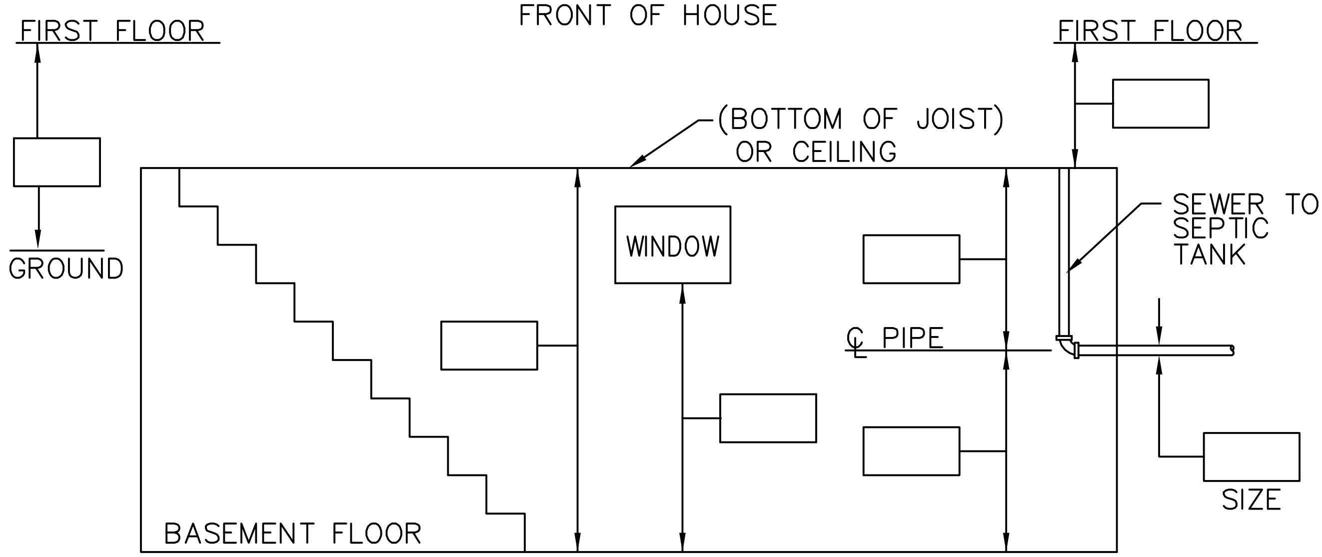
Example Surveyor Certification notes can be found in Section 4.4.6.1. A certification note, placed on the project title sheet, is required for all projects and should reflect the specific type of survey performed.

PROPERTY OWNER: ______________________________

SHOW LOCATION OF SEWER SERVICE EXITING RESIDENCE:

IF HOUSE SITS ON CORNER, SHOW AND LABEL EACH STREET

FRONT OF HOUSE



TYPE OF STRUCTURE:
Basement ______ BiLevel ______ TriLevel ______ Slab on Grade ______ Crawl Space ______
Other ______________________________

BASEMENT FACILITIES: DISCHARGE TO:

			Septic Tank (Gravity)	Sanitary Pump
Sink	Yes ______	No ______	______	______
Shower	Yes ______	No ______	______	______
Toilet	Yes ______	No ______	______	______
Washer	Yes ______	No ______	______	______
Sump Pump	Yes ______	No ______	______	______
Sanitary Pump	Yes ______	No ______	______	______
Floor Drain	Yes ______	No ______	______	______
Other	Yes ______	No ______	______	______

COMMENTS: ______________________________

Date: ______________ Survey By: ______________

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EASEMENTS

7.1 PURPOSE

All public sanitary sewers, storm drains, and open channels must be constructed in public rights-of-way, easements or on publicly owned properties. No approval will be given for construction or improvement of any public sewer, storm drain, or channel without provision of suitable permanent easement or right-of-way. The developer on private development projects will be responsible for acquiring all easements. Document recording will be the responsibility of the developer.

7.2 EXISTING EASEMENTS

Each existing easement to be used shall be shown on the plans submitted for review and approval. The information shown on the plans shall include the Deed Book and Page Number, or Instrument Number, of the recorded easement. All restrictive clauses as to the use of the easements, i.e., for utility purposes, drainage, sanitary sewers, etc., shall be noted on the plan adjacent to the pertinent easement. Construction of sanitary sewers or drainage systems will not be permitted in existing exclusive gas, electric, water, or telephone easements unless a Sanitary Sewer and Drainage Easement is acquired overlapping the existing easement with approval of the affected agency.

Existing drainage easements generally do not provide for the construction of sanitary sewers. In order to use these easements for sanitary sewer construction a new easement will be required to convert the existing Drainage Easement into a Sanitary Sewer and Drainage Easement. Construction plans and easement plats shall be prepared accordingly and the proposed new easement should be shown in the same manner as an entirely new easement.

7.3 DEFINITIONS

The following terms define the methods under which New Albany/Floyd County will acquire interest in property for the purpose of constructing, operating, and maintaining wastewater pumping, drainage facilities and sanitary sewers:

7.3.1 Fee Simple Title

For the purpose of constructing major aboveground structures, New Albany/Floyd County will normally acquire all rights to the required property in fee simple and permanently retain ownership. This generally refers to large pumping stations, and major detention basins.

7.3.2 Sanitary Sewer and Drainage Easement

For the purpose of constructing facilities (sanitary sewers, storm drainage systems, etc.), New Albany/Floyd County will acquire the right to construct facilities within the limits of easements. They will have the right to operate and maintain those facilities within the same limits and also have reasonable ingress and egress over each affected property to the easements for construction, operation, maintenance and reconstruction. These easements are permanent in nature and are referred to as Sanitary Sewer and Drainage Easement. Crossings between Sanitary Sewer and Drainage Easements, and Utility Easements, are acceptable.

The limits of Sanitary Sewer and Drainage Easements shall be set for permanent structures. Existing structures shall not be within the easement area, unless the sewer construction actually requires the removal of such buildings or structures.
A property owner generally is restricted from constructing any facility within the limits of the easement that might interfere with the maintenance and operation of the facility.

7.3.3 Temporary Construction Easement

A temporary construction easement will be required adjacent to all new Sanitary Sewer and Drainage Easements when necessary for construction operations. Temporary construction easements shall be required for structure removal, access roads, stockpiling, and other construction activities when necessary. Structure removal includes the removal of treatment plants, pump stations, etc. Sufficient area shall be supplied for movement of equipment and materials to accomplish the intended activity within the Temporary Construction Easement. If at all possible, Temporary Construction Easements will not be acquired on adjacent private property when the proposed facility lies within a dedicated right-of-way or an existing Sanitary Sewer and Drainage Easement. Only under certain unusual conditions will a Temporary Construction Easement be acquired from a parcel if a new permanent easement is not being acquired from that same parcel. Accordingly, no plats shall be prepared showing Temporary Construction Easements only. "Consent and Release" may be used in lieu of temporary easement. Temporary Construction Easement lines may be drawn through permanent structures; however, the Contract Documents shall contain language, which clearly indicates that all such permanent structures shall not be disturbed during construction. After the project is completed and the property is restored to its prior condition, all rights to the property are relinquished.

7.3.4 Access Easement

All Sanitary Sewer and Drainage Easements must have access to a public right of way. If there is no access from a public right of way, a permanent access easement will be required. The access easement will allow the City Ingress/Egress from a public right of way to the Sanitary Sewer and Drainage Easements. The maximum distance between access easements is 400 linear feet. No fences shall be constructed in an access easement. The access easement shall be labeled as a Sanitary Sewer and Drainage Easements.

7.4 EASEMENT WIDTHS

Whenever possible, the total easement width, permanent and temporary, should be sufficient to permit the contractor to have flexibility in the method of construction.

Widths of Sanitary Sewer and Drainage Easements and Temporary Construction Easements using trench construction are tabulated below. In no case shall these guidelines be a substitute for sound engineering judgment. Access Easements in New Albany shall be a minimum 12'. Access Easements in Floyd County shall be a minimum 15'.

Table 1. Minimum Easement Widths

Size of Pipe	Sanitary Sewer and Drainage*	Temporary	Total
Minimum	15'	20' on each side	55'
24" - 48"	20'	20' on each side	60'
54" and larger	30'	25' on each side	80'

* Unless otherwise approved by New Albany/Floyd County

7.5 CONSTRUCTION PLAN REQUIREMENTS

7.5.1 General

Construction plans shall be prepared in a manner, which will show clearly, and correctly, the information necessary for the acquisition of each parcel of land required. They must accurately show the location of each parcel and its relationship with surrounding areas. The alignment, as shown on the construction plans and easement plats, must agree with the alignment staked in the field. The information shown must be authentic and thoroughly checked since it will become legal evidence regarding the parcels of land required. The plans shall carry appropriate certifications and seals indicating that the surveying has been accomplished under the supervision of a Land Surveyor registered with the State of Indiana. They shall also meet the Minimum Standards of Practice for Land Surveying in Indiana and the following guidelines:

A. An effort should be made to parallel property lines with the facility when topographic features permit.

B. Easements shall be referenced to property corners and/or known landmarks to the degree that they can be accurately reestablished prior to construction.

C. In residential areas, all topographic features, such as trees, shrubs, sheds, etc., located within the easements shall be properly identified on the plans. When undeveloped wooded areas are encountered, only those trees of unusual size or nature need to be specifically identified on the plans. Any items within these easements, which are definitely not to be disturbed during the construction, shall be clearly noted "Do Not Disturb" (DND). Items, which remain, but which must be disturbed for construction shall be noted "Do Not Remove" (DNR).

7.5.2 Easement Description Criteria

The construction plans shall show the following information for each parcel from which easements are to be acquired:

A. Property owner's name of record and address on the Property Acquisition Summary Sheet.

B. Subdivision name and plat number.

C. Existing rights-of-way and easements.

D. Existing Sanitary Sewer and Drainage Easements, their Deed Book, Page Number.

E. Property lines with label.

F. Parcel numbers.

In addition, the Deed Book and Page Number, or Instrument Number, for the new easement shall be added to the plans when the information is made available by New Albany/Floyd County.

7.6 EASEMENT PLAT CRITERIA

7.6.1 General

A. <u>Sanitary Sewer and Drainage Easements</u>

Easement plats shall be prepared for each property having a Sanitary Sewer and Drainage Easement or other type of acquisition. The phrase "Sanitary Sewer and Drainage Easement" shall be used on all plats and acquisition documents.

All plats shall have the title block in the lower right corner of the plat and the Land Surveyor's Certification and Seal in the lower left corner. No other format should be submitted and none will be accepted.

Permanent easement on all plats is to be hatched for clarity. Temporary easements are not to have hatching, cross-hatching, or shading. A sample “Easement Plat” is shown in Exhibit 7-1.

B. Release of Existing Easements

Any release of easement is to have its own plat and the area of easement to be released is to be crosshatched. No plat containing both easement dedication and release of easement will be accepted. New Albany/Floyd County must approve the release of easement and the applicable fees must be paid. All other requirements of easement plats shall apply to easement release plats. A sample “Release of Easement Plat” is shown on Exhibit 7-2. The easement release (“Quitclaim”) requirements and procedures are found on the New Albany or Floyd County web page.

C. Encroachment Plats

On occasion a permanent structure is found to be, or required to be, encroaching upon an existing easement. In such situations, an easement encroachment plat must be prepared and recorded. A sample “Easement Encroachment Plat” is shown on Exhibit 7-3.

Easement plats should contain sufficient information to enable a Land Surveyor to locate and stake the easements in the field.

D. Consent and Release

In order for work to be done on a property with no easement, the property owner must sign a Consent and Release Form. A sample “Consent and Release Form” is shown in Exhibit 7-4.

7.6.2 Plat Information

The “Easement Plat Checklist” indicates the plat requirements and should be referenced prior to all submittals. It is located in Exhibit 7-6, and can be found at www.floydcounty.in.gov/county%20offices/stormwater.htm and www.newalbanystormwater.org.

7.6.3 Property Service Connection Easement

Occasionally, a Sanitary Sewer may be located such that the permanent easement does not extend to the property line of an adjacent property to be served with a proposed property service connection.

In these instances, a 15’ Sanitary Sewer and Drainage Easement shall be provided from the proposed service facility easement to the property line at the most likely location of the property service connection. Sufficient Temporary Construction Easement shall also be depicted.

7.6.4 Easements on Railroad Rights-of-Way

Sanitary Sewer and Drainage Easements may be acquired on railroad rights-of-way. However, acquisition of easement on a railroad right-of-way does not eliminate the requirement of submitting a Railroad Crossing Conflict Drawing for approval of conduits crossing under rails of the affected railroad.

7.6.5 Certificates

A Certificate of Easement, Certificate of Easement Release, or Certificate of Encroachment Agreement, as applicable, must be made a part of each easement plat submittal. The certificate forms are available at www.floydcounty.in.gov/county%20offices/stormwater.htm and www.newalbanystormwater.org.

It is the responsibility of the Land Surveyor to attach the proper certificate to each easement plat submitted. No changes in the format of these certificates by the Land Surveyor shall be permitted.

7.6.6 Submission

After the easement requirements have been defined, one set of preliminary plats shall be submitted for review. After incorporating any review comments, the final submittal will be in the following form:

A. The original of each plat, signed in ink.

B. One copy of each plat.

C. One copy of each plat with the appropriate easement certification sheets attached.

Copies of all easement plats submitted shall be clearly legible and shall be made on bond, or better grade, paper using an electrostatic or equivalent copier utilizing a dry process. Plats submitted that are not clearly legible or do not meet the above requirements, will not be accepted.

Easement plats submitted shall contain a Land Surveyor's original stamp, signature and date. If any changes or revisions are necessary on the easement plats, the Surveyor shall be notified and must make the necessary revisions and resubmit the plats as previously described.

Easement location and requirements shall be determined as early as possible on all projects in order to initiate the acquisition procedures as early as possible. Adherence to this procedure should minimize the possibilities of project delays due to unavailability of required easements.

7.7 PROPERTY ACQUISITION SUMMARY SHEET

Property data shall be shown on the Property Acquisition Summary Sheet, as well as on the construction plan sheet and easement plat. However, a separate Property Acquisition Summary Sheet will not be required if a project has five parcels or less. In such instances, the property acquisition information in the same format may be placed on the Plan Sheet Index, on the first plan sheet if adequate space is available, or be included in the plan index on the cover sheet.

An example of the layout for the Property Acquisition Summary Sheet is shown in Chapter 4 on Exhibit 4-16. The Property Acquisition Summary Sheet shall show the following data for each parcel required for right-of-way purposes:

7.7.1 Parcel Number

Parcel numbers shall be assigned to each parcel of property to be acquired and shown on the plans. Parcel number 1 shall be assigned to the first parcel, and the remaining parcels shall be numbered consecutively from the beginning to the end of the project. Parcel numbers shall not be assigned to publicly-owned rights-of-way.

Parcel numbers assigned to each tract shall not be changed after submission of the final easement plats. If it is then determined that acquisition from any parcel will not be required, that number shall be removed from the plans and the notation "NOT USED" shall be placed in the owner's block on the Property Acquisition Summary Sheet.

7.7.2 Owner's Name

The name of the current owner of the property and address, at the time of the preparation of the plans, shall be shown. Final changes to the Property Acquisition Summary Sheet will be made when the property is being acquired.

7.7.3 Property Address

The address of the property served shall be shown. Should the owner's mailing address differ from that of the property, the owner's mailing address should be shown in the remark’s column.

7.7.4 Plan Sheet Number

The sheet number is the number assigned to the plan sheet on which the particular parcel is shown. Some parcels, of course, will appear on more than one plan sheet and all sheet numbers must be included.

7.7.5 Source of Title

This column shall show the Deed Book and Page Number, or Instrument Number, of the parcel or the subdivision name, section number and lot number when a deed has not been recorded, or such other evidence of title information as may be available.

7.7.6 Total Area of Tract

The total area of the tract from which an easement is being obtained shall be shown in either acres or square feet in the appropriate column. In general, the area of subdivision tracts shall be shown in square feet, while the area of larger tracts, generally more than an acre, shall be shown in acres.

7.7.7 Area of Easements

The area required for a Sanitary Sewer and Drainage Easement shall be shown in square feet or acres in the appropriate column. The area required for a Temporary Construction Easement shall be shown in square feet or acres in the appropriate column. Areas shall be shown to the nearest square foot or one-thousandth of an acre as appropriate.

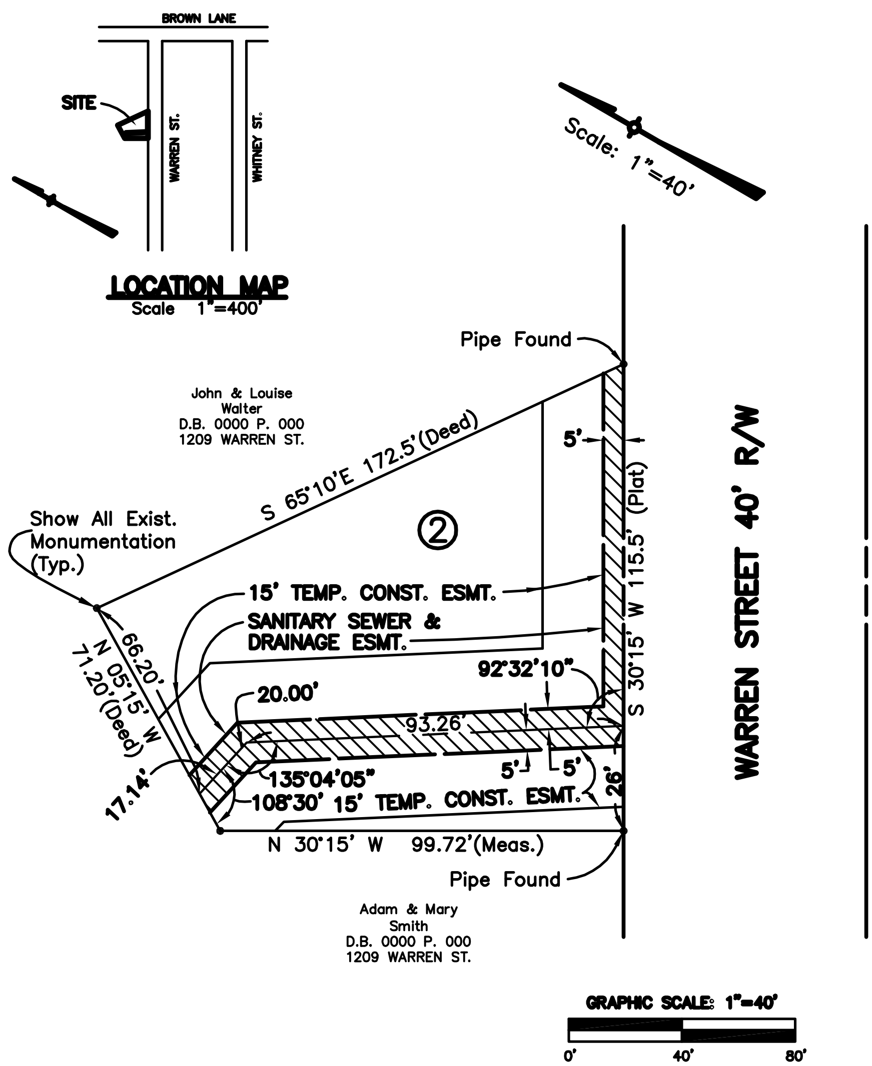
The easement areas required on the Property Acquisition Summary Sheet shall generally be shown in square feet for easements of one acre or less and shown in acres for easements of more than one acre.

7.7.8 Permanent Easement

The Deed Book and Page Number, or Instrument Number, of the newly recorded easement will be entered in the appropriate columns if the information is available prior to the submittal of final plans.

EXHIBIT 7-1
SAMPLE SANTIARY SEWER & DRAINAGE EASEMENT PLAT

EFFECTIVE DATE: DECEMBER 2012



PERMANENT EASEMENT = 1,502.5 SQ. FT.
TEMPORARY CONSTRUCTION EASEMENT = 4,506 SQ. FT.

Being a part of the same property conveyed to the GRANTOR by deed dated January 1980, recorded in Deed Book 4911, Page 125, in the office of the Clerk of the Floyd County Court.

Tax Block ________ Lot No. ________

The reference meridian used on this plat to determine the directions of survey lines was based on the deed bearing of the NORTH line of the tract.

SAMPLE ENGINEERING COMPANY
&
ADDRESS/PHONE NO.

LAND SURVEYOR'S STAMP

I hereby certify that this plat was made under my supervision and is correct to the best of my knowledge and belief. Distances as shown on this plat have not been adjusted for closure. This easement Plat meets or exceeds the minimum standards of governing authorities.

SANITARY SEWER & DRAINAGE EASEMENT

Property of
TOM & JANE POWERS
2001 GREEN CIRCLE WAY
NEW ALBANY, IN 47150

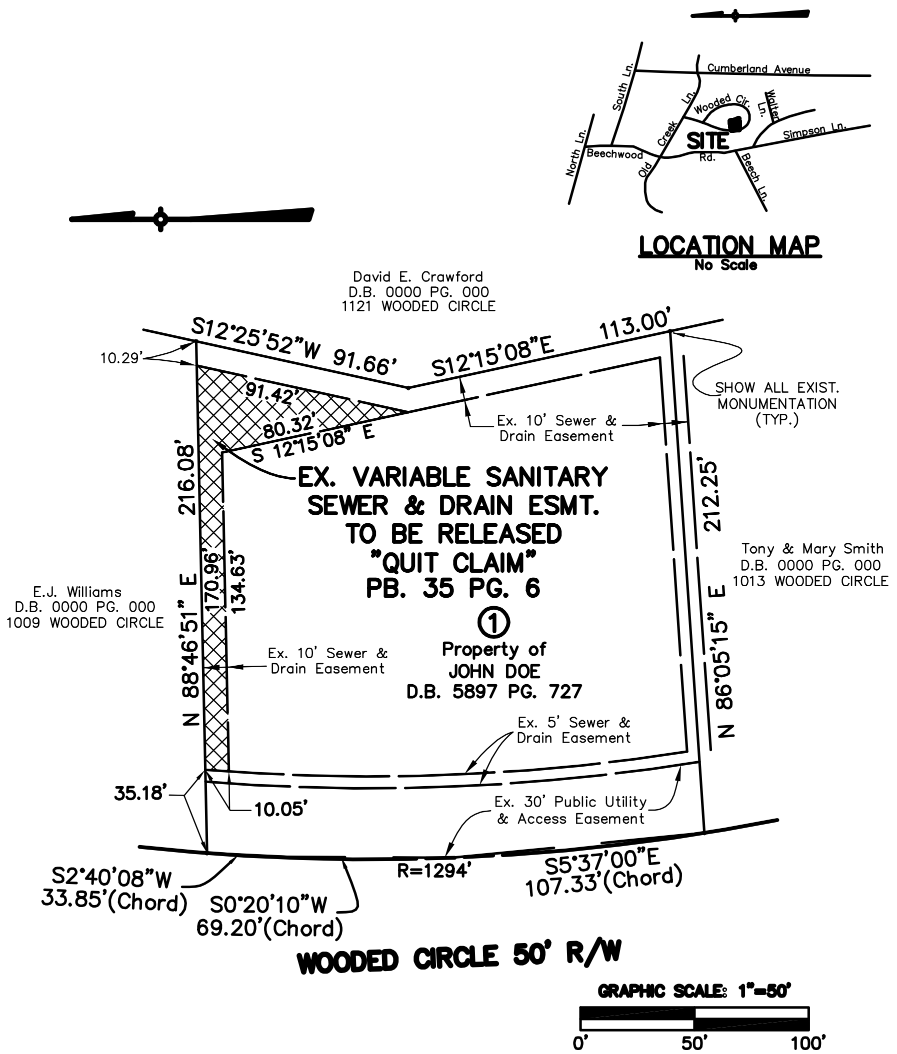
Property Address
DICK & JANE DOE
1207 WARREN STREET
NEW ALBANY, IN 47150

LAND SURVEYOR'S SIGNATURE ________ Surveyor

Parcel No. ___2___ Record No. ___5199___

Date ___10-01-00___

Sheet 1 of 3



LEGEND

Area to be released = 3,075 Sq.Ft.

All lot dimensions are per deed of record.

The reference meridian used on this plat to determine the directions of survey lines was based on the deed bearing of the NORTH line of the tract.

NEW ALBANY, IN 47150

LAND SURVEYOR'S STAMP

I hereby certify that this plat was made under my supervision and is correct to the best of my knowledge and belief. Distances as shown on this plat have not been adjusted for closure. This easement Plat meets or exceeds the minimum standards of governing authorities.

LAND SURVEYOR'S SIGNATURE ____ Surveyor

Being a part of the same property conveyed to the Grantor by deed dated SEPTEMBER 14, 1989, recorded in Deed Book 5897, Page 727, in the office of the Clerk of the Floyd County Court.
Tax Block ____ Lot No. ____

SAMPLE ENGINEERING COMPANY
&
ADDRESS\PHONE NO.

RELEASE OF
SANITARY SEWER & DRAINAGE EASEMENT

Property of
TOM & JANE POWERS
2001 GREEN CIRCLE WAY
NEW ALBANY, IN 47150

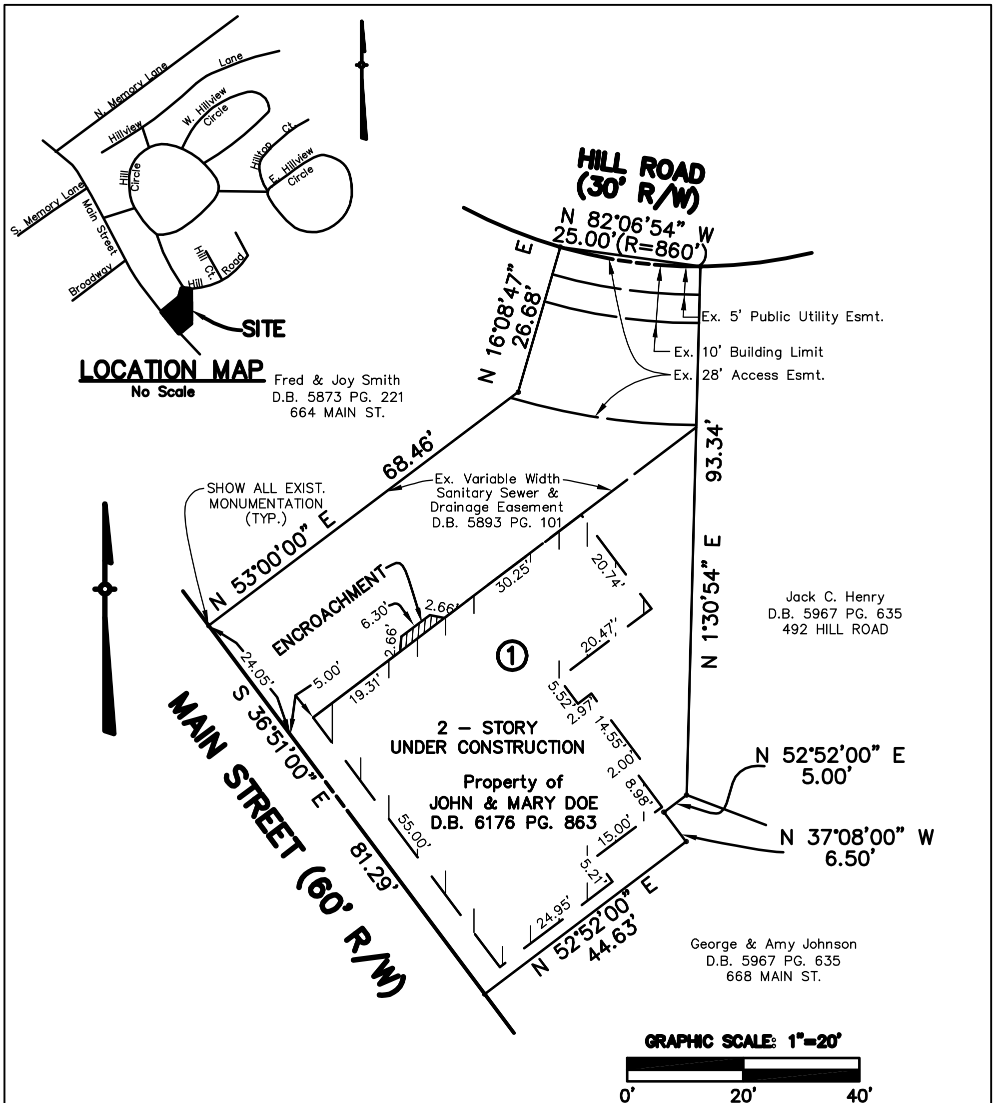
Property Adress
JOHN DOE
1011 WOODED CIRCLE
NEW ALBANY, IN 47150

Parcel No. 1 Record No. 11105
Date 10-01-00

Sheet 1 of 3

EXHIBIT 7-3
SAMPLE EASEMENT
ENCROACHMENT PLAT

EFFECTIVE DATE: DECEMBER 2012



LEGEND

Area of Encroachment 16.24 Sq.Ft.

All lot dimensions are per deed of record, unless noted.

The reference meridian used on this plat to determine the directions of survey lines was based on the deed bearing of the NORTH line of the tract.

Being a part of the same property conveyed to the Grantor by deed dated AUGUST 2, 1985, recorded in Deed Book 6176, Page 863, in the office of the Clerk of the Floyd County Court.

Tax Block ________ Lot No. ________

SAMPLE ENGINEERING COMPANY
&
ADDRESS\PHONE NO.

LAND SURVEYOR'S STAMP

I hereby certify that this plat was made under my supervision and is correct to the best of my knowledge and belief. Distances as shown on this plat have not been adjusted for closure. This easement Plat meets or exceeds the minimum standards of governing authorities.

EASEMENT OF ENCROACHMENT

Property of
TOM & JANE POWERS
2001 GREEN CIRCLE WAY
NEW ALBANY, IN 47150

Property of
JOHN & MARY DOE
666 MAIN STREET
NEW ALBANY, IN 47150

LAND SURVEYOR'S SIGNATURE Surveyor

Parcel No. 1 Record No. 6100

Date 10–01–00

Sheet 1 of 3

CONSENT AND RELEASE

This Consent and release made and entered into this ________ day of ________, 20____, by and between ______________________________, parties of the first part, and

Floyd County

WHEREAS, Floyd County deems it necessary to perform the following work in order to improve the storm drainage for the following described property, and

WHEREAS, the parties of the first part, being the owners of said property and desirous of having said work performed.

Address of Property: ____
____

Description of Work: ____
____
____

NOW THEREFORE, in consideration of the benefits accruing to said property, the parties of the first part hereby consent and agree that Floyd County. its agents, employees and assigns may enter ant come upon the above described property for the purpose of performing the work as described above and further expressly agree that the parties of the first part will assert no claim whatsoever, of any kind or type, against Floyd County, its agents, employees or assigns by reason of the performing of said work, but by these presents shall be forever barred except that Floyd County shall be liable for any damage to persons or property which results from its acts or omissions during the course of the project as it is performed on party of the first part's property and which occurs during such performance.

IN TESTIMONY WHEREOF, witness the signatures of the parties this _________ day of _______________, 20____.

PROPERTY OWNERS

____
Party of the First Part

____
Party of the First Part

BY: ____
Floyd County

(Provide one copy for property
owner and one copy for Floyd County files

CONSENT AND RELEASE

This Consent and release made and entered into this ________ day of ________, 20____, by and between ______________________________, parties of the first part, and

New Albany

WHEREAS, New Albany deems it necessary to perform the following work in order to improve the storm drainage for the following described property, and

WHEREAS, the parties of the first part, being the owners of said property and desirous of having said work performed.

Address of Property: ____
____

Description of Work: ____
____
____

NOW THEREFORE, in consideration of the benefits accruing to said property, the parties of the first part hereby consent and agree that New Albany. its agents, employees and assigns may enter ant come upon the above described property for the purpose of performing the work as described above and further expressly agree that the parties of the first part will assert no claim whatsoever, of any kind or type, against New Albany, its agents, employees or assigns by reason of the performing of said work, but by these presents shall be forever barred except that New Albany shall be liable for any damage to persons or property which results from its acts or omissions during the course of the project as it is performed on party of the first part's property and which occurs during such performance.

IN TESTIMONY WHEREOF, witness the signatures of the parties this _________ day of _______________, 20____.

PROPERTY OWNERS

____
Party of the First Part

____
Party of the First Part

BY: ____
New Albany

(Provide one copy for property
owner and one copy for New Albany files

Easement Plat Checklist

Using guidelines set forth in the New Albany/Floyd County Design Manual all easement plats must clearly provide the following:

1. A plat of the parent tract with bearing and length of each line shown and labeled (meas.) if measured in the field, (deed) if taken from deed, (plat) if taken from plat, or (calc.) if calculated. Curve lines must be labeled with enough curve data to define the curve.
2. Delineation of the new permanent easement with the bearing and length of each line (angle at each P.I. may replace bearing). Curved lines are to be labeled with curve data sufficient to define the curve.
3. Delineation of the temporary construction easement (if any).
4. Area of permanent easement to be acquired.
5. Area of temporary easement to be acquired.
6. Reference of at least one corner of the permanent easement to a corner of the present tract. More may be required in some instance.
7. Description of any monuments and notation.
8. Names of property owners and record sources of each property adjoining the new permanent easement.
9. Name of roads and width of R/W.
10. North point or reference meridian and its basis.
11. Location map of sufficient detail to locate the parcel being surveyed. Include a separate north point.
12. Parcel number to be shown within the parent tract.
13. Permanent easement to be <u>hatched.</u> Easement releases must be <u>cross-hatched.</u>
14. Limits of the permanent easement are to be clearly identified and labeled "Sanitary sewer and Drainage easement" and width to be labeled.
15. Limits of the temporary construction easement are to be clearly identified and labeled "temporary construction easement" and width to be labeled.
16. Show all existing easements with identification and record source.
17. Graphic and written scale.
18. Statement that the unadjusted error of closure meets or exceeds governing authorities.
19. Indicate method of survey where applicable: i.e. random traverse, direct-on-line, parallel offsets etc.
20. Dated signature and seal of the PLS responsible for the survey.
21. Record source of the parent property.
22. Title block containing the following:
    - Title of the survey
    - Address of the property
    - Address of the property owner
    - Name and address of the PLS or the surveying firm
    - Parcel number
    - Record number
    - Tax block and lot number
    - Date

Esmtchecklist.doe

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CHAPTER 8
EROSION PREVENTION AND SEDIMENT CONTROL and STORMWATER POLLUTION PREVENTION PLAN

Sections 8.1 through 8.8 - Applicable to Floyd County
Sections 8.1 through 8.15 - Applicable to New Albany

CHAPTER 8
EROSION PREVENTION AND SEDIMENT CONTROL and STORMWATER POLLUTION PREVENTION PLAN

8.1 PURPOSE OF THIS CHAPTER

This chapter of the Design Manual provides the user with guidance to meet the Erosion Prevention and Sediment Control (EPSC) requirements for New Albany and Floyd County. The information contained in this chapter, including the application forms, and checklists are available in digital format and can be downloaded from http://www.floydcounty.in.gov/county%20offices/stormwater.htm or http://www.newalbanystormwater.org/. This chapter also establishes requirements to be used when preparing plans for minimizing soil erosion and sedimentation during and after construction of any land development, improvement or retrofit project.

8.2 OVERVIEW OF EPSC REQUIREMENTS

An EPSC plan must be developed by the developer/engineer and approved by New Albany or Floyd County for land disturbing activities. In New Albany an Improvement Location Permit is required prior to initiating land disturbing activities in excess of one acre or situated closer than 50 feet to a Sensitive Feature, or require a building permit.

Guidelines on how to select and design EPSC Best Management Practices (BMPs) for specific construction activities have been developed by IDEM and the Southern Indiana Stormwater Advisory Committee (SWAC). The BMPs can be found in the Indiana Storm Water Quality Manual at http://www.in.gov/idem/4899.htm and the Best Management Practices Stormwater Management Manual for Southern Indiana at http://www.siswac.org/lib/man_BMP_200910009.pdf.

The detailed EPSC plan shall contain the information required by the EPSC Detailed Construction Plan Checklist found at http://www.newalbanystormwater.org/ or http://www.floydcounty.in.gov/county%20offices/stormwater.htm. When Sensitive Features are identified, a narrative description of how the delineated Sensitive Features will be protected during the proposed land-disturbing activity must be included on the plans. Submit the EPSC Detailed Construction Plan Checklist with the detailed EPSC plans to New Albany Stormwater Board or Floyd County Stormwater Department for review and approval.

8.3 SENSITIVE FEATURE IDENTIFICATION

Sensitive Features include land containing any one the following features:

A. Wetlands.

B. Stream corridors.

C. Karst features.

D. Steep Slopes and Highly Erodible Lands.

E. Lakes and Impoundments.

8.4 EPSC PLAN DEVELOPMENT STANDARDS

EPSC plans shall be developed to achieve the standards in the Indiana Storm Water Quality Manual and the Best Management Practices Stormwater Management Manual for Southern Indiana. The design storm event associated with this level of control is the 10-year, 24-hour SCS Type II storm event. NRCS procedures should be used to determine runoff amounts. Each EPSC Plan must delineate the following elements:

A. All Sensitive Features.

B. Potential sources of sediment that may potentially leave the site.

C. The location of all BMPs.

D. Installation and maintenance requirements of BMPs.

E. The sequencing of construction activities to be utilized on the project.

The following site management practices shall be utilized on the plans when feasible:

A. Minimize site disturbance to preserve and maintain existing vegetative cover.

B. Limit the number of temporary access points to the site.

C. Phase and sequence construction activities.

D. Locate temporary and permanent soil disposal areas, haul roads, and construction staging areas to minimize erosion, sediment transport, and disturbance to existing vegetation.

Detailed EPSC plans shall comply with the following standards and review criteria:

A. <u>Sediment Tracking Control</u> - Stabilized construction entrances shall be located and utilized at all points of ingress/egress on a construction site in accordance with the Indiana Storm Water Quality Manual and the Best Management Practices Stormwater Management Manual for Southern Indiana.

B. <u>Construction Dewatering Operations</u> - Whenever construction dewatering operations are required on a site, they shall be conducted according to the Indiana Storm Water Quality Manual and the Best Management Practices Stormwater Management Manual for Southern Indiana.

C. <u>Crossings of waterways</u> during construction shall be minimized. Encroachment into stream buffers, riparian areas, and wetlands shall be avoided.

D. Topsoil shall be stockpiled and protected from erosion or dispersal both during and after site grading operations.

E. Temporary Stabilization Measures - Where construction or land disturbance activity will or has temporarily ceased on any portion of a site, temporary site stabilization measures shall be installed in accordance with the Indiana Storm Water Quality Manual and the Best Management Practices Stormwater Management Manual for Southern Indiana.

F. Final Stabilization - Final Stabilization of the site shall be required within 14 calendar days of construction completion.

G. Temporary Structural Controls installed during construction shall be designed to accomplish maximum stabilization and control of erosion and sedimentation, and shall be installed, maintained, and removed according to the Indiana Storm Water Quality Manual and the Best Management Practices Stormwater Management Manual for Southern Indiana. All temporary structural controls shall function as designed when controlling the peak runoff resulting from the storm event identified in this Section.

H. All Permanent Structural Controls including drainage facilities such as channels, storm sewer inlets, and detention basins, shall be designed according to the standards set forth in this Design Manual.

8.5 EROSION PREVENTION MEASURES

Erosion prevention measures shall be used during and after construction site preparation in order to safely convey clean water to storm drains or adequate watercourses. One or more measures should be utilized as appropriate during the project's construction phase. Such measures may include but are not limited to: phasing and construction sequencing, surface roughening, temporary seeding, mulching, matting, and geotextile blankets. Each of these measures is discussed in the Indiana Stormwater Quality Manual developed by the IDEM, and the Best Management Practices Stormwater Management Manual for Southern Indiana developed by the SWAC.

In addition to site-specific erosion prevention measures, the grading plan should include the following general measures as a minimum:

A. Cuts or fills should not be so close to property lines as to endanger adjoining property without adequately protecting such properties against erosion, sedimentation, slippage, settlement, subsidence, or other damages.

B. Subsurface drainage should be provided in areas having a high water table to intercept seepage that would affect slope stability, bearing strength or create undesirable wetness.

C. No fill shall be placed where it can slide or wash onto another property.

D. Fill shall not be placed adjacent to channel banks where it can create bank failure, reduce the capacity of the stream, or result in downstream sediment deposition.

E. All borrow and disposal areas should be included as part of the grading plan.

F. Adequate channels and floodways should be provided to safely convey runoff from the developed area to an adequate outlet without causing significant channel erosion, degradation, or increased off-site flooding.

G. The site should be graded to direct flows to appropriate controls.

8.6 TEMPORARY SEDIMENT CONTROL MEASURES

New Albany/Floyd County emphasizes erosion prevention in EPSC plans. However, there are always instances where erosion cannot be prevented. For these situations, temporary sediment controls must be implemented to control the migration of eroded sediment off site. Temporary sediment control measures, in the Indiana Stormwater Quality Manual developed by the IDEM, and the Best Management Practices Stormwater Management Manual for Southern Indiana developed by the SWAC, are to be followed. One or more of the measures should be utilized as appropriate during the project's construction phase.

8.7 RUNOFF CONTROL AND CONVEYANCE MEASURES

Runoff control and conveyance measures, in the Indiana Stormwater Quality Manual developed by the IDEM, and the Best Management Practices Stormwater Management Manual for Southern Indiana developed by the SWAC, are to be followed.

8.8 CONSTRUCTION DEWATERING

Construction dewatering measures, in the Indiana Stormwater Quality Manual developed by the IDEM, and the Best Management Practices Stormwater Management Manual for Southern Indiana developed by the SWAC, are to be followed.

THE REMAINDER OF THIS CHAPTER HAS BEEN ADOPTED BY THE CITY OF NEW ALBANY ONLY; HOWEVER, THIS DOES NOT PRECLUDE THESE SECTIONS FROM BEING IMPLEMENTED BY FLOYD COUNTY.

8.9 PERIMETER CONTROL PLAN REQUIREMENTS

A. A Perimeter Control Plan (PCP) shall be approved by the city prior to breaking ground or disturbing soil in order to install sediment control practices at the hydraulic perimeter/outfall(s) of a construction site.

B. Clearing, except that necessary to establish sediment control devices, shall not begin until all sediment control devices have been installed and have been stabilized.

C. The PCP does not give permission to the permit holder to break ground or disturb soil on the entire construction site, as is granted through the approval and issuance of a Storm Water Quality Management Permit (SWQMP).

D. Contractors shall install sediment control measures in accordance with the PCP and weekly inspect and maintain the facilities throughout construction.

E. The PCP shall:

1. Include measures to minimize erosion and prevent sediment from leaving the site during initial disturbance activities and prior to temporary or permanent erosion prevention and/or sediment control practices;

2. Address downstream outfall points;

3. Prevent sediment deposition on properties adjacent to the project site. Consider applicable BMPs relevant to the type of flow, site terrain, soil type and other factors;

4. Only utilize buffer strips for sheet flow which shall be at least, but not limited to, 25 feet in width;

5. Include locations and descriptions of construction entrances and exits that comply, at a minimum, with BMP standards; and

6. Protect outlets such as pipes, drains, culverts, conduits or channels and significantly minimize erosion and sedimentation by implementing BMPs to reduce the velocity of flows from the project site.

F. The Indiana Stormwater Quality Manual developed by the IDEM, and the Best Management Practices Stormwater Management Manual for Southern Indiana developed by the SWAC, are to be followed when preparing the PCP.

G. The Stormwater Board reserves the right to develop or adopt other guidance documents to serve as design and implementation standards. These documents may be applied by the Stormwater Board as standards by which designs are to be prepared and controls implemented.

8.10 PERIMETER AND OUTFALL INSPECTIONS

A. Upon implementation of the PCP, a perimeter and outfall protection inspection will be performed to ensure that the contractor installed the sediment control measures in accordance with the PCP approved by the Stormwater Board. The inspection shall include participation by the Stormwater Board, the permittee and the permittee's contractor.

B. Inspection shall be performed within seven normal business days after the submittal of a written request to the Stormwater Board, but prior to any disturbance or clearing of soil permitted under the SWQMP. The inspector shall either approve the portion of work completed or shall notify the permittee where the work fails to comply with the approved PCP. If the inspection is not performed within seven business days of receipt of written notice, then it shall be considered approved for site wide work, but open to future comments from the Stormwater Board.

C. Inspection of perimeter protection BMPs shall consist of a visual check for each type of BMP to ensure that each was designed and installed according to site specific conditions.

D. The PCP shall consider and address any seasonal variations which may hinder the effectiveness of the BMPs. Seasonal variations may include changes in flow, hydrology, temperature and vegetation. BMPs shall be designed according to these variations and maintained to the appropriate level of service.

8.11 STORMWATER POLLUTION PREVENTION PLAN REQUIREMENTS

A. Construction plan sheets and an accompanying narrative report shall be submitted describing existing and proposed site conditions.

B. Included are the following:

1. An index indicating the location in the construction plans of all information required by this division;

2. Description of the nature and purpose of the project;

3. Legal description of the project site. The description should be to the nearest quarter section, township and range, and include the civil township;

4. Soil properties, characteristics, limitations, and hazards associated with the project site and the measures that will be integrated into the project to overcome or minimize adverse soil conditions;

5. General construction sequence of how the project site will be built, including phases of construction;

6. Fourteen digit watershed hydrologic unit code (HUC);

7. A reduced plat or project site map showing the lot numbers, lot boundaries and road layout and names. The reduced map must be legible and submitted on a sheet or sheets no larger than 11 inches by 17 inches for all phases or sections of the project site;

8. A general site plan exhibit with the proposed construction area superimposed on ortho aerial map at a scale of one inch equals 100 feet. The exhibit should provide two foot contour information and include all roads and buildings within a minimum 500 feet radius beyond the project boundaries;

9. Identification of any other state or federal water quality permits that are required for construction activities associated with the owner's project site;

10. Temporary stabilization plans and sequence of implementation;

11. Permanent stabilization plans and sequence of implementation;

12. Temporary and permanent stabilization plans shall include the following:

    a. Specifications and applications rates for soil amendments and seed mixtures; and

    b. The type and application rate for anchored mulch.

13. Anticipated inspection and maintenance requirements for permanent and temporary measures. This shall include weekly routine inspections and the expected maintenance activities (such as removal of waste concrete).

14. A description of potential pollutant sources associated with the construction activities that may reasonably be expected to add a significant amount of pollutants to stormwater discharges, including:

    a. Waste concrete management;

    b. Material delivery, handling and storage;

    c. Sanitary/septic waste management;

    d. Solid waste/trash and debris management;

    e. Spill prevention control and countermeasures;

    f. Vehicle and equipment cleaning, fueling and maintenance; and

g. Sensitive and vegetated area preservation.

15. Material delivery, handling and storage associated with construction activities shall meet the spill prevention and spill response requirements of 327 I.A.C.2 6.1.

16. The Storm Water Pollution Prevention Plan (SWPPP) shall include provisions for addressing the following issues as applicable to the site specific construction activities:

    a. Dewatering operations;

    b. Contaminated soil management;

    c. Hazardous materials and waste management;

    d. Pesticides, herbicides and fertilizer use;

    e. Collection system maintenance;

    f. Drainage system flushing;

    g. Over water activities;

    h. Fueling; and

    i. Oil Changes.

17. The Stormwater Board reserves the right to develop or adopt other guidance documents to serve as design and implementation standards;

18. Vicinity map depicting the project site location in relationship to recognizable local landmarks, cities and major roads, such as USGS topographic quadrangle map or county or municipal road map;

19. An existing project site layout that must include the following information:

    a. Location, name and normal water level of all wetlands, lakes, ponds and water courses on, or adjacent to, the project site;

    b. Location of all existing structures on the project site;

    c. One hundred year floodplains, floodway fringes and floodways. Please note if none exists;

    d. Soil map of the predominant soil types, as determined by the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Soil Survey or as determined by a soil scientist. A soil legend must be included with the soil map;

e. Identification and delineation of vegetative cover, such as grass, weeds, brush and trees, on the project site;

f. Location of storm, sanitary, combined sewer and septic tank systems and outfalls;

g. Location of regulated drains, farm drains, inlets and outfalls, if any exist of record;

h. Land use of all adjacent properties; and

i. Existing topography at a contour interval appropriate to indicate drainage patterns.

20. Final project site layout, including the following information:

    a. Location of all proposed site improvements, including roads, utilities, lot delineation and identification, proposed structures and common areas;

    b. One hundred year floodplains, floodway fringes and floodways. Please note if none exists; and

    c. Proposed final topography at a contour interval appropriate to indicate drainage patterns.

21. Plans shall include the following information:

    a. Provisions for operation and maintenance of measures identified in the PCP;

    b. Make clear the erosion prevention and sediment controls which are most appropriate to the specific site conditions;

    c. Illustrate the location and extent of erosion prevention and sediment controls;

    d. Sequencing and schedule information, structural and nonstructural BMPs, temporary and permanent stabilization measures;

    e. Provisions for construction phasing. This shall be designed so that stripping and clearing of the site exposes only the area necessary for immediate activities and minimizes the amount of soil exposed at any one time. This includes rough grading, construction of utilities, infrastructure and buildings and final grading and landscaping. Phasing shall identify an expected date when clearing of the area will begin and the estimated duration of exposure. The sequence of phased clearing and the installation of temporary and permanent erosion control measures shall be identified;

f. Provisions for stabilizing denuded areas and soil stockpiles within 15 days of final grade;

g. Provision for stabilizing cut and fill slopes.

(1) Minimization of erosion shall be the objective when designing and constructing cut and fill slopes. Length, steepness, soil type, upslope tributary area, groundwater and other relevant factors shall all be taken into account.

(2) Stabilization practices such as rock rip rap, geosynthetic material or other methods approved by the Stormwater Board shall be used on cut and fill slopes at three to one (3:1) (horizontal to vertical) or greater.

(3) Cut and fill slopes, except those indicated below, shall be stabilized with permanent or temporary soil stabilization measures within 15 days of either achieving the final grade, or within 15 days to any area that will remain dormant for over 60 days.

(4) Any cut and fill slopes with a grade of 18% or greater shall be either temporarily or permanently stabilized within 48 hours.

h. Erosion prevention measures shall be designed to minimize the suspension of sediment from the soil. The controls may function independently or in combination with sediment control measures, to prevent sediment laden runoff from leaving the construction site. Acceptable erosion prevention practices shall be defined by the Stormwater Board guidance documents referenced in Section 8.2; and

i. Sediment control measures shall be designed to remove sediment, by settling, flocculating, filtering or other means, from storm runoff prior to discharge from the construction site. The controls may function independently or in combination with erosion prevention measures to prevent sediment laden runoff from leaving the construction site. Acceptable sediment control practices shall be defined by Stormwater Board guidance documents referenced in Section 8.2.

8.12 REQUIREMENTS FOR INDIVIDUAL LOTS

A. Although no EPSC permit is required for individual lots within a larger permitted project, a formal stormwater review shall be required prior to the issuance of New Albany’s approval.

B. All stormwater management measures necessary to comply with this section must be implemented in accordance with the permitted EPSC plan for the larger project. Existing drainage channels and flow patterns that are part of the larger project shall not be modified.

C. Temporary erosion prevention and sediment control measures may be removed during finish grading and reinstalled after completion. Prior to permanently removing temporary erosion prevention and sediment control measures, permanent stabilization shall be in place a minimum of seven calendar days for sod and 45 calendar days for seed and straw.

8.13 NOTICE OF TERMINATION

A. The project site owner shall plan an orderly and timely termination of the construction activities, including the implementation of stormwater quality measures that are to remain on the project site.

B. The project site owner shall submit a Notice of Termination (NOT) letter, at the completion of construction, to the Stormwater Board in accordance with the following:

1. The project site owner shall submit an NOT letter when the following conditions have been met:

    a. All land disturbing activity, including construction on all building lots, has been completed and the entire site has been stabilized; and

    b. All temporary erosion and sediment control measures have been removed.

2. The NOT letter must contain a certified statement that each of the conditions in this section have been met.

3. A representative designated by the Stormwater Board may inspect the project site to evaluate the adequacy of the remaining stormwater quality measures and compliance with the NOT letter requirements. If the inspection finds that the project site owner has sufficiently filed a NOT letter, the Stormwater Board shall forward notification to IDEM. Upon receipt of the certified NOT letter and receipt of written approval from IDEM, the project site owner shall no longer be responsible for compliance with this section.

4. After a certified NOT letter has been submitted for a project site, maintenance of the remaining stormwater quality measures shall be the responsibility of the individual lot owner as well as occupier of the property.

5. The project site owner may submit an NOT letter to obtain early release from compliance with this section, if the following conditions are met:

    a. The remaining 95% is built and stabilized with contiguous areas not exceeding one acre;

    b. A map of the project site, clearly identifying all remaining undeveloped lots, is attached to the NOT letter. The map must be accompanied by a list of names and addresses of individual lot owners or individual lot operators of all undeveloped lots;

c. All public and common improvements, including infrastructure, have been completed and permanently stabilized and have been transferred to the city or another appropriate local entity;

d. The remaining acreage does not pose a significant threat to the integrity of the infrastructure, adjacent properties or water quality; and

e. All permanent stormwater quality measures have been implemented and are operational.

C. Acceptance of site conditions shall be made by the Stormwater Board or its designated representative based upon an inspection. If any of the following items are deemed to be insufficient, not appropriate and/or inconsistent with the SWPPP or objectives stated in this section, the NOT application shall not be approved:

1. Pipes, channels, catch basins, water quality treatment devices and other infrastructure are clear of sediment, obstructions and debris and are designed and operating as appropriate for final site conditions;

2. Slopes are permanently stabilized;

3. Temporary erosion prevention or sediment control devices (such as silt fence and staking, outlet protection and the like) have been removed (as appropriate) and any resulting soil disturbance stabilized;

4. Temporary pollution prevention practices have been demobilized or removed and affected areas stabilized;

5. Sediment has been removed and slopes stabilized for permanent flood control and water quality control practices;

6. Detention pond grading is stabilized and/or excess sediment removed so that actual volume is at least equal to designed volume and condition; and

7. Other items as deemed to be important by the Stormwater Board.

D. As-Built Drawing Submittal requirements.

1. A SWQMP shall be considered open and active until a time when the Stormwater Board or it’s representative accepts the site conditions and as built requirements have been completed.

2. Prior to issuance of a certificate of occupancy by the city, the as-built condition of critical stormwater management facilities must be reviewed and approved by the Stormwater Board.

3. The volume, capacity, slope, configuration, condition, as built plans and topographic information, as well as all pipe size, material, lengths, for all

detention, retention and water quality practices shall be certified by a professional engineer or land surveyor licensed in the State of Indiana. This information shall be provided to the Stormwater Board in the form of an as built drawing or other electronic format accepted by the Stormwater Board. The as built certification shall indicate if final conditions are consistent with, or exceed, the SWQMP provisions.

4. If it is determined that information provided in the as built drawing, certification, inspection or survey of the site do not meet or exceed the SWQMP requirements, the city reserves the right to withhold certification of occupancy. Furthermore, other enforcement mechanisms may be applied to the person certifying the as-built information.

5. If, upon inspection by the Stormwater Board or designated representative, it is determined that there is an item that must be addressed to receive acceptance of the site conditions, then the inspections and maintenance shall continue as described in the SWQMP.

6. See Chapter 5 for additional as-built drawing submittal requirements.

8.14 POST CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

A. The Post Construction SWPPP shall include the following information:

1. Location, dimensions, detailed specifications and operation details of all post construction stormwater quality best management practices (BMPs), as defined in the Stormwater Board guidance documents, referenced in Section 8.2.

2. A long term operation and maintenance agreement containing maintenance guidelines for all post construction stormwater quality measures to facilitate their proper long term function. This agreement shall be made available to future parties, including property owners, who will assume responsibility for the operation and maintenance of the post construction stormwater quality measures.

3. A sequence describing when each post construction stormwater quality BMP will be installed.

B. The post construction SWPPP shall include provisions for buffers.

1. The waterway buffer will be used to define areas where land disturbance activities shall be permitted, but construction of any building or structure shall not be permitted.

2. A waterway buffer shall be applied as required by IDEM Rule 5 and IDEM Rule 13.

3. Automatic exemptions are granted so long as, erosion prevention and sediment control, water quality and cut fuill policies are adequately addressed.

Exemptions shall be granted for:

(a) Roads and utilities crossing waterways; and
(b) Pedestrian trails and walkways proximate to waterways.

4. The waterway buffer and floodplain may be used for the application of water quality devices. This may only be permitted if erosion prevention and sediment control, water quality and cut fill polices are adequately addressed as determined by the Stormwater Board according to the provisions of this section.

C. A licensed professional engineer in the State of Indiana shall stamp all construction plans and long term maintenance documentation. This shall include all proposed improvements or modifications to existing or new stormwater infrastructure and other related improvements or modifications.

8.15 BMP DESIGN REQUIREMENTS AND CRITERIA

A. The Stormwater Board reserves the right to develop or adopt other guidance documents to serve as design and implementation standards. Other guidance documents distributed by the Stormwater Board should be reviewed and considered when preparing the post construction SWPPP. These documents may be applied as standards by which designs are to be prepared and controls implemented.

B. The post construction SWPPP shall include provisions for stormwater quality BMPs functioning independently or in combination and shall comply with Rules 5 and 13. Acceptable stormwater quality BMPs shall be defined by policy and guidance documents as approved by the Stormwater Board.

C. The post construction SWPPP shall include provisions for stormwater quality BMPs that are designed to achieve the following design/performance objectives:

1. Reduce or buffer increases in stormwater runoff temperature caused by contact with impervious surfaces;

2. Reduce or buffer increases in stormwater flow rate caused by increases in directly connected impervious area and overall impervious area; and

3. Storm water detention facilities shall be designed to address the rate at which flow is released over the entire runoff discharge period over the critical design storm period if defined by Stormwater Board stormwater master plans. The primary outlet structure shall be designed as a v-notch weir or other multiple stage configurations capable of controlling the discharge rates for the two, ten and 25-year design storm events. The emergency outlet shall be designed to safely bypass the 100 year storm event. Flows from the two, ten and 25-year design storm events shall not enter the emergency outlet.

D. If available, each post construction SWPPP shall be evaluated for consistency with the stormwater master plan or watershed study for the major watershed or watersheds within which the project site is located. The individual project evaluation will determine if stormwater quantity and quality management practices can adequately serve the property and limit impacts to downstream public and private properties. The presence of a regional facility(s) will be considered in determining the extent to which quantity and/or quality controls will be necessary.

E. The Stormwater Board reserves the right to require superseding or additional treatment criteria or objectives for specific pollutant(s) as necessary to meet overall storm water quality management program objectives or directives under a watershed improvement or Total Maximum Daily Load (TDML) program as administered by the USEPA or the State of Indiana.

F. On site BMP coordination with regional BMPs.

   1. All properties are expected to implement on site stormwater quality control measures, but the extent of application may be reduced given the availability, proximity and nature of regional stormwater quality BMPs.

   2. The extent and type of onsite stormwater quality management practices implemented shall be proportionate to the land use, pollutant discharge potential and proximity to regional stormwater quality management practices.

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GEOTECHNICAL

9.1 PURPOSE

This section establishes the minimum standards for performing geotechnical explorations on New Albany/Floyd County projects. Geotechnical explorations are required on all New Albany/Floyd County projects, unless otherwise directed by New Albany/Floyd County. Reasons for performing geotechnical explorations include, but are not limited to, the following:

A. To establish the bedrock depth along the alignment of proposed sewers or at the location of proposed structures.

B. To determine the subsurface profile and properties (texture, moisture content, density, shear strength, compressibility, etc.) of soil and bedrock materials. This information is needed for the design of below grade structures, (wetwells, junction structures, tanks, etc.) building foundations, sheeting and bracing systems, retaining walls, stable channel slopes, pavements, and embankments.

C. Additionally, this information is necessary when unsuitable foundation conditions are at the trench subgrade level or when unstable trench wall conditions are anticipated.

D. To investigate the subsurface conditions at tunnel or boring and jacking sites. The composition and nature of materials at underground crossings is needed to establish the conditions to be encountered (soft ground, hard ground, or mixed face tunneling) and the appropriate construction method.

E. To provide information regarding groundwater so that the contractor can plan for an adequate dewatering system.

F. To determine pavement section makeup, layer thickness and condition.

9.2 GENERAL

9.2.1 Right of Entry

When the geotechnical exploration work will require entry onto private property, the property owner shall be contacted, the work described, and permission to enter obtained. Efforts to contact property owners shall include telephone calls and the leaving of letters for those who are not at home. In some instances, New Albany/Floyd County may deem it necessary to issue a letter of introduction and identification (on New Albany/Floyd County letterhead), which the geotechnical field party will provide to the owner. In the event that the owner does not grant permission, and it is evident that the geotechnical work will be delayed, New Albany/Floyd County should be notified, in writing, immediately. It is the responsibility of New Albany/Floyd County to take whatever course of action is deemed necessary to obtain the legal right of entry in accordance with state statutes.

9.2.2 Protection of Underground Structures and Utilities

Prior to drilling and sampling in public rights-of-way and easements, Indiana811 shall be called at 811 or 1-800-382-5544 and requested to mark the locations of existing underground facilities. At least 3-business days notice is required for service. Indiana811 confirmation numbers should be documented so that a record for the request is available. Drilling should not begin until clearance has been provided or notification that all underground utility lines are marked has been received.

On private property, Indiana811 may not maintain records. It then becomes necessary to employ the property owner's assistance and knowledge of service lines, underground storage tanks, septic tank facilities and/or use visible surface features, such as meter vaults, shut-off valves, etc., to estimate the locations of underground facilities. Borings should be offset accordingly, if necessary, to avoid any conflicting utilities.

If there is any reason to believe that an underground facility exists in an area to be drilled, and its location cannot be determined with reasonable accuracy, then that boring should not be advanced.

9.2.3 Erosion Prevention and Sediment Control/Ground Restoration

All efforts should be extended to avoid rutting, especially in residential areas. Ruts should be repaired with leveling the area with topsoil and seeding or sodding as required by New Albany/Floyd County or as agreed upon with the property owner.

When using a truck-mounted drill rig, efforts should be made to access boring locations without crossing streams. In the event that crossing a stream is necessary to access a critical boring location, a ford in the stream, which is regularly used by the property owner, should be used after receiving approval from the property owner and New Albany/Floyd County. Any rutting should be repaired with seeding and sodding as described above.

Dozer roads cut to permit access to boring and sounding locations should be leveled and seeded and strawed immediately following completion of the work.

Upon completion, borings should be completely backfilled from the bottom to the ground surface, using excavated cuttings. Reversed auger rotation or down pressure on the drill tools should be used to achieve compaction. In sodded areas, the sod should first be carefully cut, lifted from the boring site, and set aside. After backfilling, the sod should be replaced over the boring and tamped. Asphalt cold patch or concrete should be used to repair borings in pavements.

When drilling around sinkholes or at a site with the potential to drain storm water directly into a water feature (including streams, lakes or impoundments, or along steep slopes), special care should be taken to place all auger cuttings back into the hole. If excess cuttings remain, they should be removed from the site.

9.3 DRILLING AND SAMPLING

9.3.1 Methods and Equipment

Unless otherwise authorized by New Albany/Floyd County, power equipment shall be utilized to obtain geotechnical data. In most cases, this will involve a truck or skid-mounted soils drilling rig equipped with continuous flight mechanical augers. In some instances it may be advantageous to use an air track rock drill if only rock soundings are being performed. In areas where drilling rig access is restricted with steep slopes, heavy woods, soft ground, or where the rock surface is known to be shallow with reasonable assurance (for example, next to a rock bottom stream), New Albany/Floyd County may permit the use of manually driven sounding rods or hand augers.

In general, all soil test borings shall be performed in accordance with ASTM D 1586 "Standard Method for Penetration Test and Split Barrel Sampling of Soils". Split-barrel samples shall be taken at five-foot depth intervals and at changes in strata. When undisturbed samples in clay soils are required (for example, when shear strength determinations are needed), samples should be obtained in accordance with ASTM D 1587 "Standard Practice for Thin-Walled Tube Sampling of Soils".

Observation wells should be installed in completed soil borings whenever groundwater is encountered during the drilling process. Casing should be of 1-inch diameter field slotted PVC pipe. Water table readings should be obtained from observation wells no sooner than seven days from completion of the boring.

Rock core drilling shall be performed in accordance with ASTM D 2113 "Standard Practice for Diamond Core Drilling for Site Investigation", except when wire line drilling is permitted. The diameter of the rock core shall not be less than 2-1/8 inches.

9.3.2 Location, Frequency and Depth Requirements for Soundings and Borings

Rock soundings should be performed at intervals of 50 feet where rock is encountered and 100 feet where rock is not encountered along the proposed alignment of collector and interceptor sewers, manholes, pump stations, and underground structures. The soundings should be advanced to a maximum depth, which corresponds to one foot below the invert elevation or to auger refusal, whichever occurs first. The requirements for rock soundings may be waived by New Albany or Floyd County in areas of New Albany or Floyd County where the bedrock surface is known to be deeper than excavation depths.

The requirements for soil test borings will be evaluated by New Albany/Floyd County on a project-by project basis. In general, soil test borings will be required for sewers located in areas with deep, potentially unstable soils or where high groundwater may be expected. When required, soil test borings should be drilled at approximate intervals of 500 feet and should be terminated 4 feet below the invert elevation or at auger refusal, whichever occurs first. If bedrock occurs higher than the invert elevation, then rock core drilling should extend the boring to 2 feet below the invert elevation.

Whenever possible, the boring plan should be developed to position test borings at locations of special interest. For example, test borings should be sited at the deepest excavation or where the open trench may affect existing buildings or major utilities. Borings should be drilled at the access pits or shafts of tunnels. If access is available, intermediate borings along the tunnel alignment should be advanced at 100-foot intervals. For pump stations, the number of borings needed may vary based on the number and layout of the individual facilities, but at a minimum borings will be advanced at the wet well and valve vault.

9.4 LABORATORY ANALYSES

Representative split-barrel samples should be analyzed for Atterberg limits, (ASTM D 4318) particle size distribution (ASTM D 422), specific gravity (ASTM D 854) and moisture content (ASTM D 2216). The samples should then be classified in accordance with ASTM D 2487 "Test Method for Classification of Soils for Engineering Purposes".

Representative samples of soil materials, which are to be placed and compacted to controlled moisture-density conditions, should be subjected to Standard Proctor moisture-density tests (ASTM D 698) to determine the maximum dry density and optimum moisture content. Additionally, for any projects requiring pavement design, representative samples of proposed subgrade soils should be subjected to laboratory California Bearing Ratio tests (ASTM D 1883) to provide design CBR values.

When shear strength parameters are required for geotechnical analyses, these parameters should be determined as follows. The shear strength for non-cohesive materials (sand and sand-gravel mixtures) should be measured in accordance with ASTM D 3080 "Standard Test Method for Direct Shear Test of Soils under Consolidated-Drained Conditions". The undrained shear strength for cohesive soils (clays) should be measured in accordance with ASTM D 2166 "Standard Test Method for Unconfined Compressive Strength of Cohesive Soil". The drained shear strength for cohesive soils should be measured in accordance with ASTM D 4767 "Standard Test Method for Consolidated-Undrained Triaxial Compression Test on Cohesive Soils."

9.5 REPORT DEVELOPMENT AND DRAFTING

Reports of geotechnical explorations should include discussions on the project, general site conditions, site geology, scope of work, results of the exploration, and conclusions and recommendations relative to the proposed design and construction. More specifically, the site description should include discussions of the site topography, site drainage characteristics, any existing improvements, proposed improvements, etc. Descriptions of the site geology should include underlying soil types and rock formations. Other geologic features such as faults or susceptibility to sinkholes should also be included. A description of the scope of work should also be provided and should include a complete description of the drilling, sampling, and laboratory analysis programs. The results of the exploration should include descriptions of soil types, depths, the presence and depth of any groundwater, etc. Descriptions of rock cores should note the presence of joints, voids, mudseams, recovery ratios and rock quality designation values. References to site locations should also be included. In addition, any engineering analysis performed (slope stability, settlement, etc.) should be discussed. Finally, the conclusions and recommendations relative to design and construction from a geotechnical standpoint should be included.

When submitting the results of rock line soundings, the depth intervals of any rock remnants or hard clay soils encountered above the top of rock should be reported.

Geotechnical exploration data, including boring locations, graphical boring logs, sounding symbols, penetration test blowcounts, unconfined compressive strengths, natural moisture contents, groundwater elevations, top of rock elevations, etc., should be placed on the plan and profile drawings by the Design Engineer. The drawings should reflect the difference between soundings performed with mechanical augers and soundings performed with manually driven sounding rods. For intervals that have been sounded by mechanical augers and by manually driven soundings rods, report both sets of data. The elevations of any rock remnants or hard clay soils encountered above the top of rock should also be noted on the drawings. Refer to the New Albany/Floyd County Geotechnical Legend Sheet, Exhibit 9-1, for the appropriate symbols. New Albany/Floyd County drafting standards as outlined in Chapter 4 should be followed.

EXHIBIT 9-1
GEOTECHNICAL LEGEND SHEET

EFFECTIVE DATE: DECEMBER 2012

RQD (%)	Rock Quality
90–100	Excellent
75–90	Good
50–75	Fair
25–50	Poor
0–25	Very Poor

LIMESTONE

SANDSTONE

NONDURABLE SHALE (SDI≤89)

DURABLE SHALE (SDI≥90)

Description of Soil Relative Density or Consistency

SOIL TYPE	RELATIVE DENSITY OR CONSISTENCY	RANGE OF PENETRATION RESISTANCE	RANGE OF UNCONFINED COMPRESSIVE STRENGTH
Fine grained soils (More than half of material is smaller than No. 200 sieve size)	Very Soft Soft Medium Stiff Very Stiff Hard	Less than 2 blows per foot 2 – 4 4 – 8 8 – 15 15 – 30 >30	Less than 0.25 tsf 0.25 – 0.50 0.5 – 1.0 1.0 – 2.0 2.0 – 4.0 >4.0 tsf
Coarse grained soils (More than half of material is larger than No. 200 sieve size)	Very loose Loose Medium Dense Very Dense	Less than 4 blows per foot 4 – 10 10 – 30 30 – 50 >50	Not Applicable

Unified Soil Classifications

MAJOR DIVISIONS		SYMBOL	NAME
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well–graded gravels or gravel–sand mixtures, little or no fines
		GP	Poorly graded gravels or gravel–sand mixtures, little or no fines
		GM	Silty gravels, gravel–sand–silt mixtures
		GC	Clayey gravels, gravel–sand–clay mixtures
	SAND AND SANDY SOILS	SW	Well–graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty Sands, sand–silt mixture
		SC	Clayey sands, sand–clay mixture
FINE GRAINED SOILS	SILTS AND CLAYS LL IS LESS THAN 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	SILTS AND CLAYS LL IS GREATER THAN 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
UNCLASSIFIED MATERIAL		NONE	Non–classified material (i.e. concrete, asphalt, crushed stone, cinders, slag, rubble, talus, etc.) Include visual description

AI	Activity Index
LI	Liquidity Index
N	Penetration Resistance
S+C(%)	Material finer than No. 200 sieve
•S	Location of Sounding
•SB	Location of Soil Boring
	Location of Soil Boring and Rock Core
	Water Elevation
	Thin–walled Tube Sample
<	Standard Penetration Test Sample
Qu	Unconfined Compressive Strength
w(%)	Moisture Content
RQD(%)	Rock Quality Designation
SDI(%)	Slake Durability Index
Rec.(%)	Core Recovery
ϕ	Angle of Internal Friction
$\bar{\phi}$	Effective Angle of Internal Friction
c	Cohesion
$\bar{c}$	Effective Cohesion
γ	Total Unit Weight
M	Manual Rod Sounding – No Rock Encountered
M	Manual Rod Sounding to Rock
A	Auger Sounding – No Rock Encountered
A	Auger Sounding to Rock

PLANS PREPARED AND SUBMITTED BY:

CONSTRUCTED BY:

COMPANY NAME DATE

FINAL RECORD DRAWING BY:

COMPANY NAME

SIGNATURE DATE

FINAL RECORD DRAWING

NO. DATE REVISION CHK'D APPR'D DATE MSD APPROVALS

Signature L.S.# Land Surveyor's Seal

Signature P.E.# Professional Engineer's Seal

Design Consultant

Signature L.S.# Land Surveyor's Seal

SCALE: As Shown

DATE: MM–DD–YY

CONSTRUCTION CONTRACT NO.

RECORD NO.

SHEET OF

DRAWN BY

DESIGNED BY

CHECKED BY

RECORD DWG.

NAME

DATE

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CHAPTER 10
STORMWATER FACILITIES DESIGN

10.1 PURPOSE

This chapter establishes the minimum standards for the planning and design of drainage systems and stormwater management facilities. The criteria in this section shall apply to all drainage facility design in both the local and through drainage systems except where facilities have significant and immediate impact upon State or Federal property or highways. In those cases, the most restrictive of State, Federal or these standards shall govern.

Stormwater design information may be retrieved from the Floyd County web page at http://www.floydcounty.in.gov/county%20offices/stormwater.htm or the New Albany web page at http://www.newalbanystormwater.org/.

10.2 HYDROLOGY FOR STORMWATER FACILITIES DESIGN

10.2.1 General

This section describes the recommended procedures for calculating the runoff generated from a project site. Correct utilization of these procedures should result in the best available estimation of existing and projected runoff. The procedure will also provide the consistency of results necessary when applied to project sites throughout New Albany and Floyd County.

It is assumed that practicing Engineers involved with preparing drainage plans have adequate knowledge of the recommended procedures. There is, therefore, no attempt in this Design Manual to provide step-by-step calculation methodologies.

The runoff calculation procedures to be utilized depend upon the size of the proposed development or project as follows:

A. If the total tributary area to an existing or proposed stormwater facility on the project site is 50 acres or less, and no storage design is required, the method of runoff calculation shall be the Rational Method.

B. If the total project drainage area is greater than 50 acres, or storage design is required, a discharge hydrograph must be calculated using the NRCS method or another method that has been approved.

C. The Rational Method may be used to design through drainage channels if the drainage area of the channel is 50 acres or less; otherwise, the channel shall be designed by NRCS runoff calculation methodology or another method that has been approved. Note: See Exhibit 10-1 for guidance in selecting the appropriate method.

10.2.2 Design Storm

The selection of a design storm is the basis for all runoff calculations and facility design for a project site. The facility specific requirements and associated check frequencies are found in Section 10.3.7.

Localized restrictions may be placed on some areas, based upon existing drainage problems or flooding frequency. The elevation of the 100-year, 24-hour pre- and post-development discharge shall be checked for all drainage system designs to assure conformance with the guidelines of the FEMA Program. The elevation for the 100-year, 24-hour post-development discharge shall be conveyed within the limits of the proposed easement.

10.2.3 Runoff Calculation Methods (Design Flow)

10.2.3.1 Rational Method

10.2.3.1.1 General

The Rational Method is the recommended runoff calculation procedure for project sites where:

A. The total drainage area is 50 acres or less.

B. Detention/Storage design is not required.

10.2.3.1.2 Calculation

A. The Rational Method shall be performed as follows:

$$Q = C \times I \times A$$

Where:

Q = Peak runoff (cu. ft. per sec.)
C = Runoff coefficient
I = Rainfall intensity (inches/hour)
A = Contributing area (acres)

B. Rainfall Intensity-Duration Curves, Exhibit 10-2, shall be utilized in the Rational Method to determine rainfall depths and storm intensities.

C. The time of concentration (duration), Tc, shall be determined by calculating the time for a particle of water to travel from the most hydrological remote point of the project area to the point of interest. Acceptable methods to derive time of concentration are the TR-55 (Technical Release - 55, available from the NRCS) and the Kinematic Wave method. The minimum Tc shall not be less than 10 minutes to any given inlet or analysis point. Manning’s Equation should be used to estimate any in-pipe or channel travel.

D. The runoff coefficient, C, must represent a composite of the surface condition tributary to the point under consideration.

To determine the appropriate C-Factor, the hydrologic soil group and land use for each surface condition must be obtained. Hydrologic soil group descriptions can be found in Exhibit 10-4. Exhibit 10-5 then combines this information with surface slope to provide the correct C-Factor for that area. The C-Factors given may be used directly when the drainage area is homogeneous. When it is not, an appropriately weighted C-Factor must be determined.

For areas where no hydrologic soil group information can be obtained, the C-Factor shall be the values for soil group C.

If the project site conditions differ significantly from those used as the basis for the C-Factor figures, the Design Engineer must develop a specific composite C-Factor for the area. To determine the composite C-Factor for the entire project site, a weighted average must be calculated based upon the percentage of the areas with different C-Factors. The Design Engineer shall select or calculate runoff coefficients, which reflect actual proposed designs. For subdivisions, the Design Engineer shall accommodate the maximum imperviousness permitted under land use guidelines.

E. To calculate flow rates in series, i.e., in ditch or storm sewer design, the C*A term shall be summed for all contributing drainage areas. The intensity shall be selected from the time of concentration to that point. The Tc selected shall be the larger of: 1) Tc for the subject inlet or analysis point based on overland flow to said inlet/analysis point, or 2) the Tc from the previous in-line inlet or analysis point plus the travel time from the previous inlet or analysis point.

10.2.3.2 Natural Resource Conservation Service (NRCS) Methods

10.2.3.2.1 General

The NRCS Methods are required for runoff calculation procedures for project sites where:

A. The total project drainage area is greater than 50 acres or;

B. Detention/Storage design is required and the site is larger than one acre.

When these project conditions exist, the Design Engineer shall confer with New Albany or Floyd County to determine if there is a hydrologic model available for the area. If a model exists, site calculations must be performed and correlated with this data.

If models do not exist, the Design Engineer must use the NRCS Methodology to develop a hydrologic model.

10.2.3.2.2 Methods

The NRCS Methods also include the TR-20 and TR-55 Methods. Detailed descriptions, example calculations, and worksheets for these methods are available in:

A. Project Formulation - Hydrology, Technical Release No. 20 User's Manual;

B. Urban Hydrology for Small Watersheds, Technical Release No. 55; and

C. A Guide to Hydrologic Analysis Using NRCS Methods.

10.2.3.2.3 Curve Number

The Curve Number (CN) is similar to the Rational Method C-Factor in that it is based on the surface conditions of the project site. The correct CN can be determined from Exhibit 10-6.

Maps depicting the NRCS Hydrologic Soil Groups, Existing Land Use, and Projected Land Use for each watershed are available through the NRCS. This information may be used to determine the appropriate surface condition factors for use in runoff calculations as described in this Section.

10.2.3.2.4 Antecedent Runoff Condition

The index of runoff potential before a storm event is termed the Antecedent Runoff Condition (ARC). The ARC is an attempt to account for the variation in CN at a particular site for various storm conditions. The CNs in Exhibit 10-6 are for average ARC, which are used primarily for design applications. Please refer to the NRCS National Engineering Handbook, Section 4 - Hydrology (NEH-4, NRCS) for a detailed discussion of storm to storm variations and upper and lower CN limits. Adjustments to the ARC will normally be involved only in calibration.

10.2.3.2.5 Directly Connected Impervious Areas

Directly connected impervious areas shall be considered where applicable in NRCS runoff calculations. The Design Engineer shall select or calculate runoff coefficients, which reflect actual proposed designs. For subdivisions, the Design Engineer shall accommodate the maximum imperviousness permitted under land use guidelines.

10.2.3.2.6 Rainfall Duration

The minimum design storm duration for planning and design is the NRCS Method, and will utilize the NRCS Type II 24-hour rainfall distribution. Critical storm analysis shall be performed when warranted.

10.2.3.2.7 Rainfall Depth

Exhibit 10-3 shall be utilized to determine total rainfall depths for New Albany and Floyd County for use by the NRCS methods. These values are derived from NOAA Atlas 14, Volume 2, Version 3, Revised 2006, published by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and National Weather Service.

10.2.3.2.8 Rainfall Distribution

Synthetic rainfall distributions shall be used for design storm generation. When critical storm analyses are not required, the distributions shall match the NRCS Type II curve as published in NRCS Technical Report 55, with 5-minute time steps.

In some cases New Albany or Floyd County may require a critical storm analysis to determine the rainfall duration and distribution that produces the worst runoff conditions for a specific site. Since the NRCS Type II distribution represents a 24-hour duration storm only, it is not applicable to the critical storm analysis. This analysis will be based on dimensionless Huff Distributions as presented in Rainfall Frequency Atlas of the Midwest by Floyd Huff and James Angel, Midwestern Climate Center, NOAA, and the Illinois State Water Survey, A Division of the Illinois Department of Energy and Natural Resources.

10.2.3.2.9 Surface Condition Data

Maps depicting the NRCS Hydrologic Soil Groups, Existing Land Use, and Projected Land Use for each watershed in New Albany and Floyd County are available through the NRCS Web Soil Survey at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm. This information may be used to determine the appropriate surface condition factors for use in runoff calculations as described in this Section.

10.3 HYDRAULICS FOR STORMWATER FACILITIES DESIGN

This section contains the technical criteria required for the design of stormwater facilities. The Design Engineer must make adequate reference to other chapters of this manual for additional design guidelines.

10.3.1 General Guidelines

10.3.1.1 Design Flows

A. Design flows must be calculated by the appropriate method described in Section 10.2. At a minimum, the facility must have the capacity to transport the 10-year, 24-hour post-development discharge, except in retrofit projects (with approval from the New Albany Stormwater Board or Floyd County Stormwater Department). The water surface profile and through system capacity shall be checked for the 100-year, 24-hour post-development discharge. All systems must be capable of passing the 100-year, 24-hour design flow within the drainage easement. Additional facility-specific requirements are found in following portions of this Section.

10.3.1.2 Allowable Pipe Materials

A. Pipe material will be selected from the products identified in the Louisville MSD Standard Specifications. CMP is not allowed.

10.3.1.3 Roughness Coefficients "n" (See Exhibit 10-7)

A.	Concrete Pipe:	0.012
B.	Plastic (Smooth Interior Wall):	0.011
C.	Sod:	0.030
D.	Placed Riprap:	0.030
E.	Dumped Riprap:	0.035
F.	Gabions:	0.028

G. Coefficients for other approved materials shall be source documented for review.

10.3.1.4 General Pipe Design Requirements

A. Minimum velocity shall be 2 feet per second at design flow or 3 feet per second at full flow; whichever requires the greater slope. Regardless of velocity, the minimum slope for all pipes is 0.3%.

B. Minimum pipe size shall be 12 inches unless otherwise approved by New Albany or Floyd County.

C. Maximum manhole spacing

1.	Less than 18" diameter-	400'
2.	18" to 30" diameter-	500'
3.	33" and greater diameter-	600'

D. All pipes are to have headwalls. Design of headwalls shall consider traffic safety.

E. Stubs for storm sewers when required shall be 1 foot long measured from the outside of the manhole or surface inlet for PVC and PE pipe or one length of pipe for concrete pipe.

F. Submerged pipes are not desirable, but may be approved on a case-by-case basis.

G. The maximum change in direction of flow, in a stormwater structure or channel bend, is 90 degrees.

10.3.2 Storm Sewers

10.3.2.1 Design Methodology/Design Storm

All storm sewer systems will be designed for the 10-year, 24-hour storm. The 100-year, 24-hour storm discharge elevation must be checked to ensure the system does not surcharge out of any inlets and/or manholes. Manning's Equation is recommended to calculate pipe flow and velocity. The storm sewer hydraulic grade line shall be at least 1.0 foot below the ground surface or building drain elevation, whichever is lower, at all points for the 10-year, 24-hour design event. For the 100-year, 24-hour event, the hydraulic grade line may not rise higher than the ground line or building drain elevation, whichever is lower. Losses at all inlets, junction structures and bends are to be considered. Pipes on grades greater than or equal to 20% shall have anchors at each pipe joint. The Design Engineer shall check to ensure that all pipes have sufficient cover and that all structures, inlets and manholes have sufficient dimension to receive pipes, bells, frames, and grates.

10.3.3 Culverts

10.3.3.1 Design Method/Design Storm

A method as described in the INDOT Design Manual Chapter 203 Hydraulics and Drainage Design, along with the maximum allowable headwater and general requirements below, shall be used to design culverts. The design method utilized must be submitted for review.

10.3.3.2 Maximum Allowable Headwater

The most stringent requirement of the following will apply:

A. Cul-de-sacs, alleys, local streets, and collectors: Use the subgrade elevation of the adjacent roadway for the 10-year, 24-hour discharge.

B. Major and minor arterials: Use 12-inches below the shoulder elevation of the adjacent roadway for the 100-year discharge.

C. Headwater for the 10-year, 24-hour discharge shall not exceed 1.2 times the structure rise except as specifically approved on a case-by-case basis. For pipes 30” in diameter and larger, the headwater shall not exceed 1.0 times the structure rise except as specifically approved on a case-by-case basis.

D. If a culvert has a drainage area greater than one square mile or is in a regulated floodplain the 100-year, 24-hour storm headwater depth shall not be greater than 1.0 times the structure rise except as specifically approved on a case-by-case basis.

10.3.3.3 General

A. Downstream channel must receive appropriate protection or energy dissipation if the design outlet discharge would cause erosive conditions.

B. Traffic safety must be considered in the design of culvert end treatments. This may include extending the culvert beyond the right-of-way limits, installing catch basins to intercept roadside swales, and installing guardrails. Designs must conform to meet the requirements of the agency responsible for road maintenance and safety.

10.3.4 Trenchless Pipe Installation

Trenchless pipe installation for storm sewers and culverts is described in Chapter 12 of this manual.

10.3.5 Conventional Channels and Ditches

This section describes the technical criteria necessary to design stormwater channels and ditches using conventional design procedures. These procedures shall be applied to roadside and rear yard ditches and highly urbanized channels. Where possible, all waters of the state (especially in undisturbed areas) shall be designed using Natural Channel Design techniques as described in Section 10.3.6. This criterion represents minimum requirements. Justification shall be submitted for review and approval in cases where different slopes or other protective measures are recommended.

10.3.5.1 Design Methodology/Design Storm

Manning's Equation is recommended, except in cases where backwater conditions are significant. All calculations must be submitted for review. Software programs utilized must be approved.

A. Design Storm

1. Channels and ditches shall be capable of conveying the 10-year, 24-hour storm flow within their banks. Through drainage systems shall be designed to collect and transport the onsite post-development rate and the offsite existing rate of runoff for the 100-year, 24-hour design storm. In all cases, the 100-year, 24-hour discharge elevation must be checked to ensure that adjacent structures do not suffer flood damage.

2. All systems must be capable of passing the 100-year, 24-hour design flow within the drainage easement.

B. Channel Criteria

The Minimum Channel Slope shall be 0.5%, except in special cases such as retrofit projects or major channels.

C. Maximum Side Slope

1. Earth 3:1 (when depth < 8.0 feet)
   4:1 (when depth > 8.0 feet)
   2:1 (may be allowed on case-by-case basis)

2. Riprap and Aggregate 1.5:1

3. Concrete 1:1

4. No maintenance ground cover 2:1

5. Bioengineered systems on various slopes

D. Channel Depth

Channels created for new residential subdivisions shall not have a design depth of greater than 2.0’, unless otherwise approved.

E. Channel Lining

1. Channel slope 0.5% or less - Concrete. Evaluate the use of a low flow channel.

2. Channel Slope between 0.5% and 2.0% - Concrete low flow channel with durable lining for the remainder of the protected section.

3. Channel Slope greater than 2.0% - Natural vegetation, geosynthetic turf reinforcement, Rip Rap or concrete based on shear stress requirements.

4. If the design parameters are beyond the limits of natural vegetation, then a non-degradable durable material must be used. Durable channel lining is required to the depth of the 10-year, 24-hour storm. Durable channel lining may be low maintenance ground cover, sod, soil bioengineered systems, turf reinforcement mats or concrete. Rip-Rap, Aggregate Channel Lining and Gabion Baskets are to be limited to areas immediately downstream of an outlet pipe to reduce velocities and erosion potential. The use of these materials shall be a last alternative and approved on a case by case basis.

5. Trapezoidal or rectangular paved channels shall have bottom slopes no less than 1:12 sloping either to the center or to one side of the channel to provide self cleaning.

6. Channel and channel lining design shall consider the effects of open

channel junctions, curved alignment, obstructions, transitions, constrictions, changes in slope and other characteristics including the effects of subcritical and supercritical flow.

10.3.5.2 General

A. Roadside ditches on retrofit projects, which have less than a 4 foot shoulder, shall not exceed 1'-6" in depth, measured from the edge of pavement.

B. Roadside ditches and channels must have a minimum 4 foot shoulder from the edge of the pavement to the top of the bank.

C. Roadside ditches and channels in through systems must have a minimum 8-foot shoulder from the edge of the pavement to the top of the bank.

D. In areas where new sidewalks are proposed to cross swales, ditches, or channels, a culvert meeting design storm requirements must be installed extending past the sidewalk sufficiently to allow a maximum 4:1 slope.

E. Ditches and channels adjacent to state highways may require more stringent criteria. The Design Engineer must obtain the criteria from the INDOT.

F. Cutoff walls shall be placed at the beginning and end of all paved channels.

G. Utilities and their facilities should not be located within or interfere with swales, ditches, detention/retention facilities, stormwater quality treatment devices and facilities, manholes, pipes or landscaping such as trees and bushes.

10.3.5.3 Channel Design Procedure

A. The method of designing channels and ditches as presented agrees with Hydraulic Engineering Circular HEC-15 that is based on the tractive force theory. The calculated shear stress resulting from flow in a channel is compared to the maximum permissible shear stress for the channel lining selected. If the shear force induced by the flowing water equals or exceeds the permissible shear stress of the lining, failure may occur and a more resilient lining must be proposed. This concept allows for calculation of the maximum discharge a channel can carry by equating the calculated and permissible shear[1]. The procedure is applicable to channels of uniform cross section and constant bottom slope.

   The suggested step-by-step design procedure is shown below. Additional information is taken from the Federal Highway Administration's HYDRAIN software documentation manual. Other procedures and references may be utilized by the design engineer. However, it will be the design engineers responsibility to satisfy all design requirements.

B. The design procedure as shown assumes steady uniform flow with the energy slope equal to the bed slope and flow calculated using Manning's equation. For conditions other than these, the designer should consult other references;

one of which is HEC-11, which focuses on natural channels with irregular cross sections, varying bottom slopes, and flows exceeding 50 cfs.

The maximum shear stress on the side slopes is always less than or equal to that on the channel bottom and does not limit the design of a single, rigid, vegetative, gabion, or temporary lining, but may affect the design of composite linings[1]. The designer is alerted to this situation and should consult the previously noted references.

C. Design Procedure

1. Determine Drainage Area Contributing to the Channel.

2. Select Channel Cross Section- Side Slopes & Bottom Width

3. Determine Channel Longitudinal Grade

4. Calculate Design Flow - Adjust channel cross-section and grade as necessary for capacity.

5. Select Channel Lining

    a. Determine maximum permissible shear stress (τ_p) for the selected lining. See Table 8-11 in the Stream Restoration Design National Engineering Handbook at http://www.nae.usace.army.mil/reg/nrrbs/chapters/Chapter-08.pdf for a summary list of various protection measures or the manufacturer's recommendations for specific Turf Reinforcement products.

    b. Estimate flow depth in the channel.

    c. Determine Manning "n" for selected lining and depth of flow.

    d. Calculate flow using Manning's equation and the estimated flow depth.

    e. If calculated flow varies from design flow, repeat steps (b) and (d) until flows agree.

    f. Calculate actual shear stress(τ_d)

$$\tau_d = \gamma d_n s,$$

Where:

τ_d = actual shear stress 1b/ft^2
γ= specific weight of water 62.4 lbf/ft^3
d_n = flow depth in ft.
s = energy slope (bed slope); ft/ft

[1]Federal Highway Administration's HYDRAIN Software Documentation (GKY and Associates, Inc.)

g. If $\tau_d < \tau_p$, the lining selected is acceptable.

If $\tau_d > \tau_p$, consider the following:

- Select a lining with a higher permissible shear stress
- Decrease slope
- Increase the channel width and/or flatten side slopes

10.3.6 Natural Channel Design Procedures

This section describes Natural Channel Design procedures to be utilized where possible for the design of streams especially along waters of the state and in undisturbed areas. It should be noted that Natural Channel Design techniques promote enhanced stormwater quality and aquatic habitat over conventionally designed channels and ditches and is the preferred method for the design of streams.

10.3.6.1 Design Methodology

Streams designed using natural channel design techniques shall emulate naturally formed streams. The design shall be based upon measurements from reference reaches in similar physiographical regions exhibiting similar characteristics to the desired stream. The designed stream shall exhibit characteristics consistent with stream types expected to occur within the given valley type. Both the pre-existing stream type and the designed stream shall be classified in accordance with the Rosgen Stream Classification system[2].

10.3.6.2 Design Discharge

Streams designed using Natural Channel Design techniques shall include a bankfull channel design based on the bankfull discharge (also commonly referred to as the channel forming event). It approximates a 1.5-year storm event and can range between a 0.8 to 2.0-year storm event. The bankfull discharge used for design shall be determined based on field bankfull indicators and shall be checked against regional curves developed from gauged streams within the same physiographical region as the stream to be designed. Where flooding of nearby structures may occur, the floodplain area adjacent to the bankfull channel shall be designed to convey a 100-year, 24-hour storm event.

10.3.6.3 Design Submittals

All parameters/information used for the basis of design shall be submitted for review. Where an existing stream is present, the design submittal shall include calculations for the proposed channel as well as measurements from the existing channel. Information submitted shall include reference reach data and location of reference reaches.

[2]Applied River Morphology (Dave Rosgen, 1994).

As a minimum, the following design parameters/information shall be included in the design submittal: longitudinal profile; cross sectional geometry for pool, riffle and cross-over reaches; stream type; drainage area; bankfull width; mean bankfull depth; bankfull cross sectional area; bankfull discharge; mean bankfull velocity; maximum bankfull depth; width to depth ratio; width of flood prone area; entrenchment ratio; ratio of pool depth to mean bankfull depth; ratio of pool width to mean bankfull width; average riffle, pool, run and glide slope; average water surface slope; valley slope; meander length; belt width; radius of curvature; ratio of meander length to bankfull width; ratio of radius of curvature to bankfull width; meander width ratio; sinuosity; pool to pool spacing; ratio of pool to pool spacing to bankfull width; D50 of bed materials; D84 of material which will be transported during a bankfull event; critical dimensionless shear stresses; minimum mean bankfull depth calculated using dimensionless shear stress equations.

10.3.6.4 Channel Stabilization Methods

Methods to be utilized to stabilize channel banks below the bankfull depth should be included within the design submittal.

The use of rock should be limited to areas exhibiting shear stresses above allowable shear stresses for vegetation. The use of native vegetation and soil bioengineering treatments is the preferred method to stabilize channel banks.

10.3.6.5 Aquatic Habitat Enhancements

The use of aquatic habitat enhancements should be included where possible and consistent with stream types. Enhancements may include a variety of structures consistent with stream types such as woody material, rock or wood overhangs, rock vanes, cross vanes, W-weirs, J-hook weirs, stream gravel/boulders, etc. Details for all structures shall be included with the design submittal. In most instances, it is not necessary to extend any in-stream structures or bank revetments above the bankfull depth.

10.3.6.6 Riparian Corridor Enhancements

Where practical, the design shall include enhancements to the riparian corridor on either side of the reconstructed stream. Riparian corridor enhancements shall include native plantings consistent with anticipated inundation periods. Submittals shall include a description of existing vegetation within the riparian corridor as well as proposed plantings and frequency schedules.

10.3.7 Surface Inlets and Gutter Spreads

This section describes the technical criteria necessary to design surface inlets/catch basins. Please reference HEC 12, Drainage of Highway Pavements for more in depth discussions and procedures.

10.3.7.1 Design Storm

Curb inlets and gutter spreads shall be designed for a storm intensity of 4 inches per hour. All other stormwater inlets shall be designed for the 10-year, 24-hour storm return period.

10.3.7.2 Design Methodology

The design methodology utilized shall be those presented in HEC 12, Drainage of Highway Pavements or the INDOT Design Manual.

10.3.7.3 Maximum Flow Spread on Pavement

Maximum flow spreads on pavement shall be as follows:

A. Cul-de-sacs, Alleys, and Local Streets - 6 feet; 8 feet with 2 foot wide concrete curb and gutter.

B. County Through Roads - 4 feet; 6 feet with 2 foot wide concrete curb and gutter.

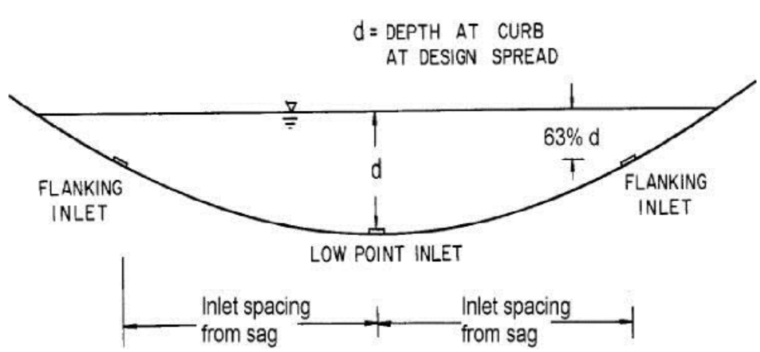
Flow spread is measured from the face of curb. The minimum slope for gutters shall be 0.50%. In addition, the flow depth at any location along the curb shall not exceed 4 inches.

10.3.7.4 General

A. Inlets shall be placed immediately upstream of pedestrian walkways and intersections and designed to intercept as close to 100% of the flow as possible.

B. Inlets placed at locations other than that described above shall be placed at locations that prevent the allowable spread or depth at curb criteria from being exceeded. Vane grates shall be used at all inlet locations.

C. Inlets at sags in curb and gutter applications shall receive careful design to prevent violation of the gutter spread requirements above. In addition, it is good engineering practice to place flanking inlets on each side of the low point inlet when in a depressed area that has no outlet except through the system. This is illustrated in the figure shown below.



The purpose of the flanking inlets is to act in relief of the inlet at the low point if it should become clogged or if the design spread is exceeded. Flanking inlets can be located so they will function before water spread exceeds the allowable spread at the sump location. The flanking inlets should be located so that they will receive all of the flow when the primary inlet at the bottom of the sag is clogged. They should do this without exceeding the allowable spread at the bottom of the sag.

If the flanking inlets are the same dimension as the primary inlet, they will each intercept one-half the design flow when they are located so that the depth of ponding at the flanking inlets is 63 percent of the depth of ponding at the low point. If the flanking inlets are not the same size as the primary inlet, it will be necessary to either develop a new factor or do a trial and error solution using assumed depths with the weir equation to determine the capacity of the flanking inlet at the given depths.

10.3.8 Detention Basins

This section describes the technical criteria necessary to design stormwater detention basins. Detention basins are typically designed to remain empty during dry weather and to backup or detain excessive runoff generated during a storm.

The designer is directed to the Detention Analysis Checklist included in this chapter and found at the Floyd County web page at http://www.floydcounty.in.gov/county%20offices/stormwater.htm or the New Albany web page at http://www.newalbanystormwater.org/.

10.3.8.1 Detention Basin Design

A. The minimum basin volume shall be the difference in runoff volume discharged from the project area to the basin site between the pre-development and post-development 100- year 24 hour storm, or such volume to sufficiently reduce post-development discharges to pre-development rates, whichever is greater. In cases where the volume requirement governs, the design calculations must not only show that the required volume has been created, but that the basin functions to detain the volume difference. Basin volume may also be dictated by limitations of downstream conditions or other requirements on a case-by-case basis.

   In many areas increased runoff volumes can be as critical, if not more critical, than the rate of discharge. This issue will be addressed on a site-specific basis. All development submittals will be evaluated for the impacts of increased runoff and volume control. Satisfying the volume requirement may be met onsite, at approved off-site locations, or by purchase of volume in a Flood Compensation Bank if one is available, with Board approval.

   Floodplain compensation at a ratio of 1.25:1 is required throughout New Albany and Floyd County. Due to the severe flooding problems in the lower portion of the Falling Run watershed, the required ratio is 1.5:1 for any fill placed in the floodplain.

In the Falling Run watershed, the volume of increased runoff must be mitigated at a ratio of 1.5:1.

The Stormwater Board may require 10% additional detention upstream of known flooding problem areas. If the Board requires detention above the additional 10% then the Board will compensate the developer for the increased cost.

If the basin is to be located directly on a portion of the through drainage system, volume calculations must also consider the total system flow reaching the basin. If the basin is to be constructed on a solid or intermittent stream, it must be beneficial to the stream corridor or the public.

Detention Basins for private development projects shall not be constructed in the Floodway. They may be constructed in the Floodplain with Board approval. Capital Project Detention Basins are constructed to compensate for additional flow from existing development. Some Capital Project Detention Basins must be built in the Floodplain or Floodway to accomplish their goals.

The discharge from a detention basin must be to an existing drainage swale, creek or ditch. All discharges to a curb or roadway must flow through a piped system with a hard structure (i.e. catch basin, manhole or junction box).

B. Maximum basin side slopes shall be 3:1, unless retaining walls are provided.

C. Low flow channels may be grass if the channel grade is between 2.0% and 4.0%.

D. Basin design must include maintenance accessibility and responsibility.

E. Requirements of Dam Safety Laws shall be observed.

F. The Design Engineer shall address provisions for anti-seep collars, extended detention basins, wet ponds, soil bioengineering, baffles, outlet protection and length to width ratios.

G. The minimum length to width ratio of detention basins shall be 3:1. Inlets (pipes or ditches) shall be no closer to the outlet than the midpoint of the basin.

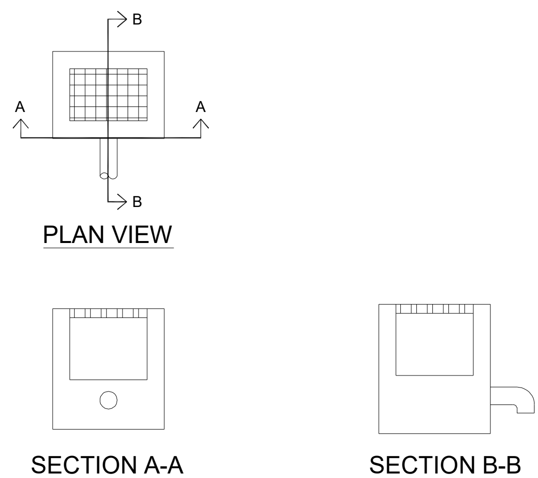
H. No sanitary sewer manholes shall be located within the detention basin.

I. Detention basins in Single Family Developments are to be placed in a lot recorded as “Open Spaces”. All other detention basins must be completely within a recorded Easement.

J. Retention basins (permanent pool basins or wet basins) shall have a minimum depth of 5’.

10.3.8.2 Basin Discharge

A. Discharge control structures shall be multi-stage and capable of limiting 2, 10, and 100-year, 24-hour post-development discharges to pre-development peak discharge rates or downstream system capacity, whichever is less, and shall be constructed of concrete or approved alternate. Principal spillways shall be designed to discharge flows from the 10 year storm with no flow in the emergency spillway. Orifices smaller than 12” shall take precautions to avoid clogging.



B. The emergency spillway shall be sized to accommodate a flow equal to the design overflow of the 100-year, 24-hour storm post-development discharge, assuming all other outlets are completely blocked, without overtopping the dam. Discharge must be conveyed to a public outlet of sufficient capacity. Erosion protection must be provided for the spillway and receiving stream and energy dissipation must be employed.

C. The dam elevation shall not be less than one foot above the 100-year, 24-hour storm storage and overflow elevation.

D. Appropriate downstream channel protection must be installed and the basin outlet pipe must be placed no closer than 15’ from an adjacent property line.

E. Storage, discharge, and routing calculations for the 2, 10, and 100-year, 24-hour discharges must be submitted for review and have a Professional Engineer’s stamp and signature.

F. The top of dam shall be at least one foot below the lowest opening of any structure adjacent to and upstream of the dam.

G. Detention basins shall be fully discharged, or return to normal pool elevation in the case of wet basins, within 36 hours after the storm event unless specifically approved.

H. The detention basin shall be the first item of construction and must be designed to function as a sediment basin through the construction period. The basin design must be checked for capacity due to additional runoff generated by disturbed site conditions. The detention basin may be designed with over-excavation to account for planned sedimentation during construction. Excess sedimentation shall be removed and disposed of properly to establish design capacity of the detention basin.

10.3.8.3 Parking Lot Surface Storage

A. Parking lot storage involves shallow ponding in a specifically graded area of a parking lot.

The major disadvantage is the inconvenience to users during the ponding function. Clogging of the flow control device and icy conditions can be maintenance and safety problems. This method is intended to control the runoff directly from the parking area and is not appropriate for storing large volumes.

B. The general design requirements are:

1.	Maximum water depth:	8 inches
2.	Maximum surface grade:	5.0%
3.	Minimum surface grade:	1.0%

10.3.8.4 Other Alternatives

A. The use of Underground Detention must be approved by New Albany/Floyd County. Underground Detention and oversized piping shall be bonded for the full construction cost, have a pre-treatment device and be tele-inspected before bond release.

B. Vegetated recessed islands, bio-swales or micro-detention are acceptable alternatives in appropriate soil conditions and will be approved on a case-by-case basis.

10.3.9 Sinkholes

10.3.9.1 General

A sinkhole is any closed depression in a limestone region formed by the removal of water, surfacial soil, rock or other material that is connected to a cavern or underground passage. The sinkhole drainage area shall include any area that contributes surface water directly to the sinkhole.

The use of sinkholes as stormwater management facilities is not permitted, unless there are no other cost-effective alternatives. The use of sinkholes must be submitted for approval.

10.3.9.2 Design

Specific design considerations for the use of sinkholes, when permitted, include but are not limited to:

A. The sinkhole shall have the volume to store a 100-year, 24-hour NRCS storm with a no outlet condition.

B. Capacity of the sinkhole, including a hydrogeologic study along with dye test results.

C. Protection measures for the sinkhole inlet.

D. Trash barriers.

E. Detention requirements.

F. An alternate means of surface water disposal in the event of sinkhole failure.

G. Restriction of development in floodplain areas adjacent to the sinkhole.

H. Review of construction methods and staging.

I. The design of sinkhole structures must be supervised by a Geotechnical Engineer, licensed in Indiana. The engineer shall also inspect and certify the construction of the sinkhole structure and certify the ability of the sinkhole to accept anticipated flows without flooding or causing property damage in the case of failure.

J. Any structural failures must be fully documented and a Geotechnical Engineer, licensed in the Indiana, must supervise design of, inspect and certify construction of repairs.

10.4 HYDROLOGIC AND HYDRAULIC MODELING STANDARDS

Development of uniform modeling standards is a means by which New Albany and Floyd County can regulate the quality of the floodplain models. Successful floodplain management requires that the hydrologic and hydraulic floodplain models be updated as changes in watersheds occur. These changes include those resulting from continued development in the watershed, as well as from physical changes in the drainage system. As the watersheds evolve over time, the modeling standards provide guidance on how changes should be incorporated into the models. The implementation of a comprehensive set of modeling standards promotes consistency in floodplain modeling, standardizes review efforts, and provides a means to educate the engineering/development community.

The following modeling guidelines are consistent with current engineering standards of practice not necessarily to the exclusion of other sound and technically supported procedures. If an alternative modeling method is proposed, a licensed professional engineer shall justify the use of any methods other than those described below in writing prior to the model submittal and review process.

10.4.1 Software Selection

HEC-1 and HEC-HMS are the recommended programs for rainfall/runoff hydrologic simulations requiring hydrograph analysis at one or more points along a stream. HEC-2 and HEC-RAS are the recommended programs for open channel flow or floodplain calculations excluding streams with extremely low or high gradient. The most current versions of these software packages are available from the Hydrologic Engineering Center's website at www.hec.usace.army.mil.

Caution should be used when converting from one version to another (for example HEC-2 to HEC-RAS) to make sure that the original intent of the model is understood. Changes to be made for the newer model should work properly and should be fully documented. The HEC manuals offer guidance for conversions to the newer versions of their software. Other software may be accepted for floodplain analysis if approved by FEMA for National Flood Insurance Program (NFIP) usage. A list of accepted models may be found at www.fema.gov. Civil site analysis, local detention basin design, water quality analysis, natural channel design, and interior drainage system design may be performed with models not on FEMA's approved NFIP list if approved by New Albany or Floyd County prior to use, on a case by case basis.

10.4.2 Hydrologic Modeling

The following methods and/or parameters shall be used for single event hydrologic analyses for streams and/or detention basin calculations.

10.4.2.1 Basin Parameters

A. Subbasin Delineation. Depending on the size and location of the watershed being analyzed, and the extents of previous modeling attempts, tributary boundaries may need to be redefined or subdivided. Drainage areas must be delineated using mapping with 2 foot contours available in New Albany and parts of Floyd County. In areas where watersheds extend into other counties and 2 foot contour data is not available, supplement the topographic data with 7-1/2 Minute USGS Topographic Quadrangles. Subbasin size in developable watershed areas should be 50 to 200 acres. Areas that are not expected to develop due to land use or zoning criteria can have larger subbasin areas based on natural drainage patterns.

B. Loss Rate. The NRCS Runoff Curve Number (CN) Method, as described in TR-55 (NRCS 1986) and NEH-4 (NRCS 1985), shall be used to estimate runoff from design storms. Continuous simulations, if necessary, may use other loss rate methodology where applicable.

C. Transform. Rainfall excess shall be transformed into runoff using the NRCS Unit Hydrograph approach.

D. Base Flow. Unless modeling the Ohio River, base flow may be ignored during floodplain analyses.

E. Time of Concentration (T_c). The time of concentration shall be calculated for each subbasin using the combined travel times for sheet flow, shallow concentrated flow, and open channel flow in accordance with TR-55 (NRCS 1986).

F. Antecedent Runoff Conditions (ARC). Average ARC shall be used in all cases except for model calibration.

G. Infiltration. Runoff infiltration will be calculated using the NRCS Runoff Curve Number (CN) Method, as discussed above. CN's should be developed for both the "existing watershed conditions" (EX) and the "fully developed watershed conditions" (FD) and analyzed separately. EX CN's shall be estimated using NRCS Web Soil Survey (located at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm) data for hydrologic soil groups, land cover type and treatment, hydrologic condition, and percentage of impervious area (connected or unconnected). Impervious area calculations should include buildings, roads, and miscellaneous transportation such as sidewalks and driveways. FD CN's shall be estimated using soils data, existing zoning regulations, and Exhibit 10-6 with maximum impervious area limitations to CN values.

H. Channel Routing. Hydrograph routing through a subbasin or along a reach of stream shall use either the Modified Puls (low gradient) or Muskingum-Cunge (moderate to high gradient) routing techniques. Muskingum-Cunge 8-point cross sections are recommended for natural channels. Routing results in the hydrologic model must correlate with the hydraulic model for the same reach.

I. Reservoir Routing. Reservoir routing may be used for modeling storage effects at bridges or culverts, or may be used for detention facility analysis. In either case, the routing method shall use an elevation-volume-outflow relationship developed by the engineer with consideration of backwater effects on the outlet hydraulics. The initial conditions of reservoir elements shall be controlled by normal dry-weather water surface elevations. Documentation of methods used to derive the hydraulic response and storage capacity of structures associated with reservoir routing should accompany the submittal.

10.4.2.2 Meteorological Parameters

A. Rainfall Duration. All models used for hydraulics analysis shall use 24-hour duration design storms.

B. Total Rainfall Depth. Rainfall depths associated with various annual exceedence probabilities are referenced from *NOAA Atlas 14 Precipitation-Frequency Atlas of the United States*, Volume 2 Version 3.0, Revised 2006. Exhibit 10-3 contains a table with various rainfall amounts for storm events.

The 24-hour duration rainfall values used for analysis are as follows:

- 2-year 3.1 inches
- 10-year 4.4 inches
- 100-year 6.8 inches

C. Temporal Distribution. The NRCS Type II rainfall distribution (5-minute increment) will be used for design storm definition in New Albany and Floyd County.

D. Spatial Distribution. Design storms shall be applied uniformly and simultaneously to subbasins of the hydrologic simulation.

10.4.2.3 Control Specifications

A. Calculation Time Step. There are five-minute (or less) calculation steps required for hydrologic modeling.

B. Simulation Length. Hydrologic models must simulate the 24-hour design storm and describe watershed response until all elements are within 5% of their initial discharge conditions.

10.4.3 Hydraulic Modeling

Water surface profile modeling is required for analyzing impacts to waters of the state and intermittent streams. The one-dimensional, steady flow calculations performed by HEC-RAS are suitable for most watershed conditions.

10.4.3.1 Study Limits

The hydraulic study shall extend upstream and downstream of the impacted reach to a point that the modified profile converges with the existing condition profile for the same event. When creating new models, verify the modeling extent with New Albany or Floyd County prior to starting the project.

10.4.3.2 Cross Sectional Geometry

A. Width. The minimum width is set by extending the left and right ends of the cross section to one foot above the 100 year floodplain elevation.

B. Spacing. Cross section locations shall be based on sound engineering judgment. Higher density is required at tributary locations, slope changes, roughness changes, valley morphology changes, and at bridges or other structures. In general, cross section locations should be based on the riffle spacing of the stream being studied. Pool cross sections may be necessary for geomorphic channel design, but are not required for floodplain determination. Cross section spacing on any stream in New Albany and Floyd County should not exceed 500 feet (excluding the Ohio River).

C. Number of Data Points. A minimum of seven data points is required to describe each cross section. The maximum number of data points is limited by software constraints.

D. Source of Geometry Data. Elevation data in the active channel shall be collected with field survey and tied to the North American Vertical Datum of 1988 (NAVD 88) . The cross section geometry shall have the density of points necessary to accurately quantify the area under bankfull elevation and the location of the stream thalweg. Two foot contour mapping may be used to supplement cross section data in the floodplain (overbanks). A licensed Land Surveyor or Professional Engineer must document the accuracy of survey information at cross sections and Structures.

E. Bank Stations. Bank stations in natural cross sections shall be placed at the geomorphic bankfull elevation. Variations in roughness values shall be included for the channel bed, left and right banks, and left and right floodplains.

F. Reach Lengths. The distances measured between cross sections at similar points are called reach lengths. HEC-RAS uses this information to compute discharge-weighted reach overbank segments. Floodplain models should use the distance measured along the stream thalweg for the centerline reach length. Left and right overbank reach lengths should be estimated as the center of mass of the floodplain discharge.

G. Roughness Values. Channel and floodplain roughness values significantly influence model accuracy. Roughness values should be reflective of the natural variations in the bed materials and overbank vegetation. Consistent with models developed in the past, Manning's n should be used to describe frictional energy losses. There are a variety of methods available for calculating Manning's n from particle size distributions of channel materials (USDA, Rosgen, and others). Listed below are some additional references available that have photographs of reaches with measured values. A listing and description of roughness values with photographs should be included in the documentation of the model development.

References:

Open-Channel Hydraulics, Chow, 1959
Roughness Characteristics of Natural Channels, Barnes, Harry H., USGS, 1967
Roughness Characteristics of New Zealand Rivers, Hicks and Mason, 1991
Stream Corridor Restoration Principles, Practices, and Processes, USDA, 1998
The Reference Reach Field Book, Rosgen, 1998

H. Expansion and Contraction Coefficients. Subcritical flow contraction and expansion coefficients are used to estimate energy losses caused by abrupt changes in the flowing cross sectional area. Typical losses occur upstream and downstream of bridge or culvert crossings and flow through a narrower portion of the valley. Where contraction and expansion losses are expected to occur, contraction coefficients should vary between 0.1 and 0.3, expansion coefficients should vary between 0.3 and 0.5. FEMA requires documentation of loss coefficients higher than these ranges.

I. Ineffective Flow Areas. Effective flow, in one-dimensional modeling, is the portion of the flow traveling in the downstream direction. Portions of the cross section that are occupied by water but not flowing in the downstream direction are described as ineffective flow areas and should be specified. A definition of ineffective flow areas should be justified in the report. Ineffective flow areas in urban watersheds must reflect current development. It is typical to have ineffective flow areas upstream and downstream of bridges.

J. Levees. The use of the levee option in HEC-RAS must be used to describe a levee in accordance with FEMA regulations and justified for NFIP use. Use of the levee option in the hydraulic model for other reasons than the description of a legitimate flood control measure must be approved in advance.

10.4.3.3 Structures

A. Required Structures. Bridges, culverts, significant pedways and other stream crossings shall be included in the hydraulic model. The geometry of the obstruction shall be surveyed and related to NAVD 88. Normal stream debris should be reflected in the reach's roughness values.

B. Analysis Methods. Refer to *Hydraulic Reference Manual* Version 2.0 or higher (HEC). The selected method is at the discretion of the engineer but must be documented in the report.

10.4.3.4 Steady Flow and Boundary Conditions

A. Frequency of Flow Data. The hydrologic model must be sufficiently subdivided to provide flow change locations along the study reach. New flow data shall be added to the hydraulic model when the flow rate changes by +10%.

B. Upstream or Downstream Boundary Conditions. Hydraulic models shall be connected by junctions or downstream boundary conditions representing larger streams. Normal depth is used to represent the upstream or downstream boundary condition, or starting water surface, when the study reach is sufficiently remote from streams with existing models. If the study reach can be extended to a modeled reach then either a junction shall be used or the downstream boundary of the new reach shall be set at the water surface elevation of the larger tributary modeled with the same storm event. This conservative "simultaneous peak" approach is used for regulatory models to define the worst possible case of floodplain inundation. A minimum of ten cross sections should be placed between the boundary conditions and the study reach.

C. Internal Boundaries (Junctions). Where possible, newly modeled tributaries will be connected to larger streams with junctions. Under most floodplain modeling conditions the energy losses occurring at locations where streams come together can be calculated with the Energy Equation option in HEC-RAS. The reach distance across junctions should be minimized to reduce errors when using this option.

10.4.3.5 HEC-RAS Methodology

A. Friction Slope. Use the HEC-RAS Average Conveyance Method.

B. Calculation Tolerances. Use the HEC-RAS Defaults.

C. Conveyance Method. The suggested method, for consistency, is to use the HEC-RAS default, which calculates conveyance in areas defined by changes in Manning's "n" values only.

D. Floodway Methodology. Floodway determinations are required for waters of the state or intermittent streams. The floodway is determined by using the encroachment options available in HEC-RAS. The floodway boundaries are established by encroaching into the floodplain, producing equal loss in conveyance from both sides of the channel until the water surface has risen 0.14 feet. Floodway determination shall include consideration of expansion and contraction losses at bridges and valley nick points. For additional guidelines refer to HEC-RAS and *Floodway Determination Using Computer Program HEC-2*, TD-5, USACE, 1988.

10.4.4 Submittals

10.4.4.1 The Floodplain/Floodway Report Details

The report shall be submitted to the New Albany Stormwater Board or the Floyd County Stormwater Department and include the following:

A. Discussion of the reasons for development or modifications of floodplain models and the standards or assumptions made. The report shall be a bound document including a cover letter signed by a licensed professional engineer.

B. Include a table defining the changes to the floodplain and the floodway limits containing the information provided in HEC-RAS with the standard table "Encroachment 1". HEC-RAS results shall be submitted for the existing, or effective model, if available, the corrected effective model showing additional geometry information from the study reach, and the proposed model.

C. Tables of the watershed and basin parameters, i.e. time of concentrations, curve numbers for existing and fully developed conditions and watershed areas.

D. Photographs of representative reaches and all bridges or culverts in the hydraulic model.

E. A table of HEC-HMS elements that correspond to flow change locations in HEC-RAS including junction name, cross section name, and the floodplain discharge.

F. Water surface profiles for all events modeled.

G. Typical cross sections showing water surface elevations and encroachment limits.

H. Hardcopies of existing HEC data files used to generate the updated models.

I. A hardcopy summary of HEC-HMS results (standard output table).

J. Digital versions of models prepared for the analysis.

10.4.4.2 Watershed Analysis Mapping

A. Mapping shall include soils, land use, zoning, streams, buildings, roads, existing and proposed floodplain/floodway boundaries, hydraulic cross sections and study reach limits, at a minimum. The standard scale for paper maps is 1” = 400’ or less using 2-ft contours. Encroachment stations shown on final mapping shall be represented in the final model runs.

B. Digital copies of cross section or subbasin modifications are required. Submittals may be as ESRI shapefiles or *.DXF files referenced to the Indiana State Plane Coordinate System, East Zone 1983 (NAD83).

10.4.4.3 Transmittal Medium

All digital materials, including HEC models, ESRI shapefiles, *.DXF files, digital photographs, H&H modeling parameters, etc. should accompany submittals on a CD or DVD bound into the report.

EXHIBIT 10-1
HYDROLOGIC METHOD
SELECTION FLOWCHART

EFFECTIVE DATE: DECEMBER 2012

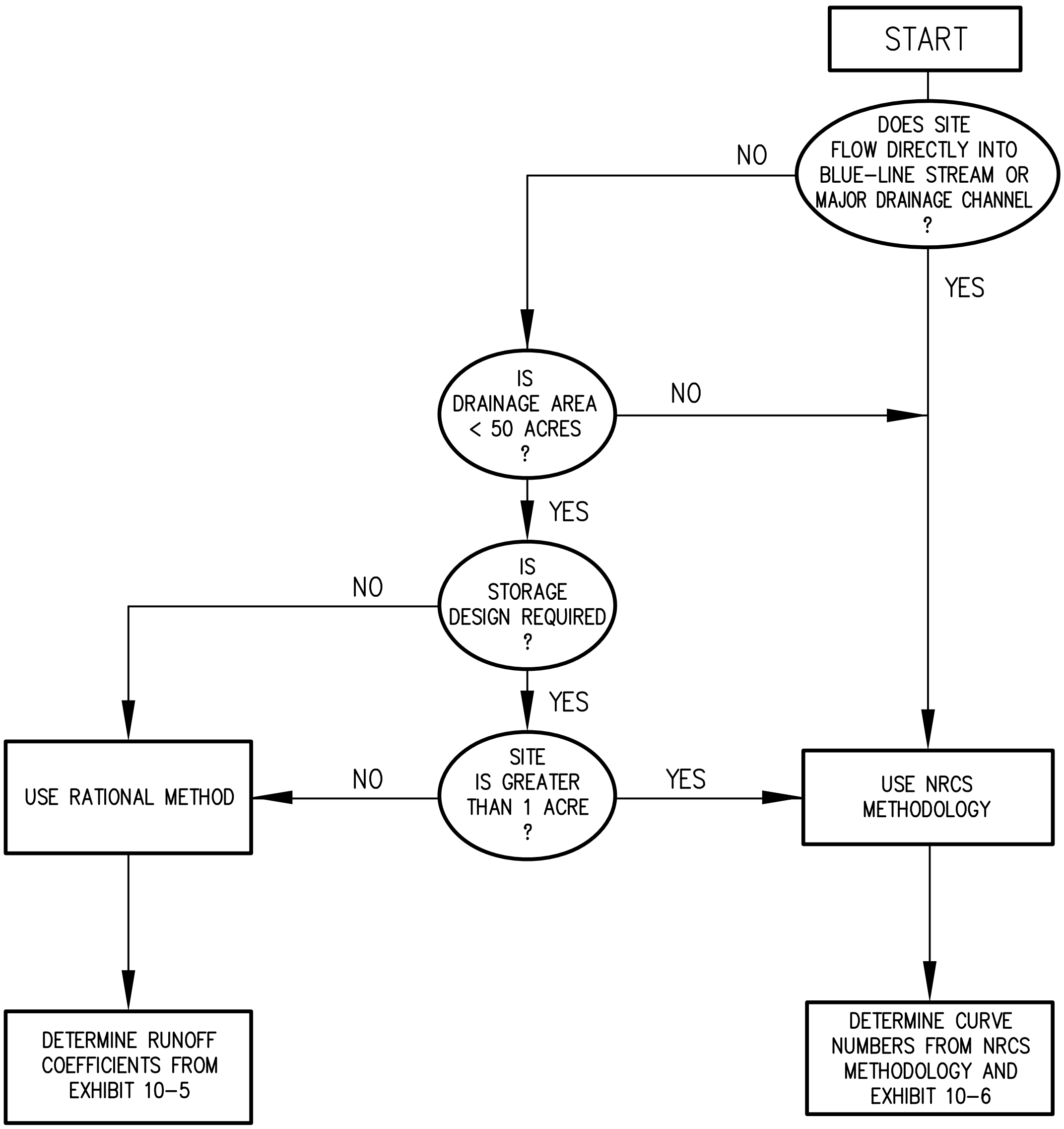


EXHIBIT 10-2
RAINFALL INTENSITY-
DURATION CURVES

EFFECTIVE DATE: DECEMBER 2012

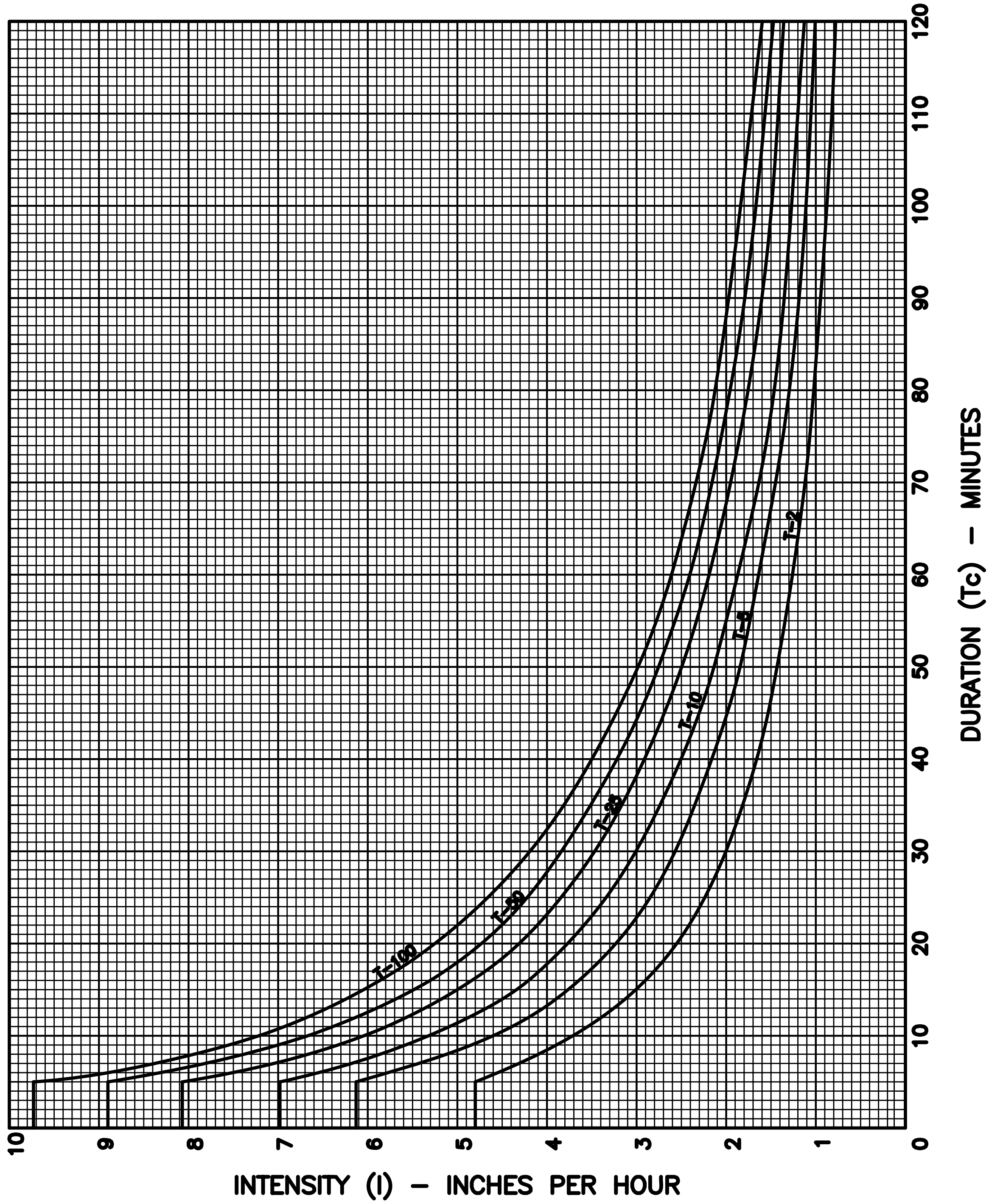


EXHIBIT 10-3
RAINFALL FOR FLOYD COUNTY
(INCHES)

EFFECTIVE DATE: DECEMBER 2012

FREQUENCY (YEARS)

DURATION	1	2	5	10	25	50	100
30 min.	0.94	1.12	1.36	1.54	1.78	1.96	2.15
1 hour	1.14	1.38	1.71	1.97	2.31	2.59	2.87
2 hour	1.38	1.66	2.06	2.39	2.84	3.21	3.60
3 hour	1.49	1.79	2.23	2.59	3.09	3.52	3.96
6 hour	1.83	2.19	2.72	3.16	3.79	4.32	4.88
12 hour	2.16	2.59	3.21	3.72	4.44	5.04	5.68
24 hour	2.56	3.07	3.81	4.43	5.31	6.05	6.84
2 day	3.06	3.67	4.54	5.25	6.27	7.11	8.00
4 day	3.47	4.15	5.10	5.87	6.94	7.82	8.75
7 day	4.12	4.91	5.99	6.89	8.16	9.22	10.3

Rainfall data taken from NOAA's National Weather Service Hydrometeorlogical Design Studies Center Precipitation Frequency Data Service (PFDS).

Hydrologic Soil Group *(HSG)*is NRCS's way of summarizing soil's hydrologic effects. This classification, with land use, is one of the determinants of NRCS's Curve Number. NRCS has categorized every soil in the country into four groups, lettered A to D. Group A is the lease likely to create runoff; group D is the most likely.

The four groups are defined by NRCS soil scientists as follows:

- **Group A** soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission (greater than 0.30 in/hr). This group also includes sand, loamy sand and sandy loam that have experienced urbanization but not been significantly compacted.
- **Group B** soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15 to 0.30 in/hr). This group also includes silt loam and loam that have experienced urbanization but not been significanly compacted.
- **Group C** soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05 to 0.15 in/hr). This group also includes sandy clay loam that has experienced urbanization but not been significantly compacted.
- **Group D** soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0 to 0.05 in/hr). This group also includes clay loam, silty clay loam, sandy clay, silty clay and clay that have experienced urbanization but not been significantly compacted.

Compound classification A/D indicates that the natural soil is in group D because of a high water table which impedes infiltration and transmission, but following artificial drainage using such methods as perforated pipe underdrains, the soil's classification is changed to A.

For a specific site, *HSG* designations can be obtained by refering to a local NRCS soil survey where one is available. If the survey does not specify *HSG*s, you can look up the soil names in the complete national listing given in NRCS's *Technical Release 55.* If there is no NRCS survey at all, you can make an on-site investigation of soil charateristics, and compare them with the above definitions.

Information about HSG on this page is from page A-1 of U.S. Soil Conservation Service, 1986, *Urban Hydrology for Small Watersheds,* Technical Release 55.

EXHIBIT 10-5 PAGE 1
RATIONAL METHOD
RUNOFF COEFFICIENTS (C-factor)

EFFECTIVE DATE: DECEMBER 2012

RUNOFF COEFFICIENTS BASED ON LAND USE, SOIL GROUP AND SLOPE RANGE

LAND USE		A			B			C			D		
		0–2	2–7	7+	0–2	2–7	7+	0–2	2–7	7+	0–2	2–7	7+
Residential	%Imp												
RE, R–1, R–2	25	.31	.35	.39	.33	.38	.43	.37	.41	.48	.40	.44	.52
R–3, R–4, R–5	38	.42	.45	.49	.44	.48	.52	.47	.50	.56	.50	.53	.59
R–5A, R–6, R–7, CN, OR–1	65	.65	.67	.69	.66	.68	.71	.68	.70	.73	.69	.71	.75
R8A OR–2, OR–3, OFT	75	.73	.75	.77	.75	.76	.78	.76	.77	.79	.77	.78	.80
Commercial Business C–M, C–1 thru C–5	85	.82	.83	.84	.83	.84	.85	.84	.85	.86	.84	.85	.86
Industrial RT, M–1, M–2, M–3	72	.71	.73	.74	.72	.74	.76	.73	.75	.77	.75	.76	.79
Roofs, Driveways Streets, Etc.	100	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Open Spaces, Lawns, Parks, Etc.	0	.09	.15	.21	.13	.19	.26	.18	.23	.32	.22	.27	.37
Woodlands,	0	.09	.15	.20	.13	.18	.23	.17	.22	.26	.20	.25	.30
Pasture, Grass, and Farmland	0	.15	.20	.25	.18	.23	.30	.22	.26	.35	.25	.30	.40
Newly Graded/Disturbed,		.65	.67	.69	.66	.68	.71	.68	.70	.73	.69	.71	.75

Unclassified Areas – These are areas where the Natural Resources Conservation Service has not identified any hydrologic soil groups

		0–2	2–7	7+
Residential	%Imp			
RE, R–1, R–2	25	.37	.41	.48
R–3, R–4, R–5	38	.47	.50	.56
R–5A, R–6, R–7, CN, OR–1	65	.68	.70	.73
R8A OR–2, OR–3, OFT	75	.76	.77	.79
Commercial Business C–M, C–1 thru C–5	85	.84	.85	.86
Industrial RT, M–1, M–2, M–3	72	.73	.75	.77

Notes:

1. Where the imperviousness is significantly different from the assumed values, a weighted coefficient should be computed using the actual percent impervious.
2. Consideration should be given to whether the soil group has been changed due to soil compaction by heavy equipment or mixing of the surfaces and subsurface soils

References:

1. Rossmiller, Ronald L., The Rational Formula Revisited, Proceedings International Symposium on Urban Storm Runoff, University of Kentucky, Lexington, Kentucky, July 28 – 31, 1980.

Runoff Curve Numbers for Urban Areas
(See Section 10.2.3.2)

Cover Description: Cover Type and Hydrologic Condition	Average Percent Impervious Area	Curve Numbers for Hydrologic Soil Group: A	B	C	D
Fully Developed Urban Areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.):					
Poor Condition (grass cover < 50%)		68	79	86	89
Fair Condition (grass cover 50% to 75%)		49	69	79	84
Good Condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right–of–way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right of way)		98	98	98	98
Paved; open ditches (including right–of–way)		83	89	92	93
Gravel (including right–of–way)		76	85	89	91
Dirt (including right–of–way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (previous areas only)		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1 to 2 inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2–2c)					

Reference Table 2–2a. pg.2–5 of 210–VI–TR–55, Second Ed., June 1986

Runoff Curve Numbers for Cultivated Agricultural Lands

Cover Description			Curve Numbers for Hydrologic Soil Group			
Cover Type	Treatment	Hydrologic Condition	A	B	C	D
Fallow	Bare Soil	—	77	86	91	94
	Crop Residue Cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight Row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR and CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured and Terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T and CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR and CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C and CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T and CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

Table 2-2b. pg. 2-6 of 210-VI-TR-55, Second Ed., June 1986

Runoff Curve Numbers for Other Agricultural Lands

Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type	Hydrologic Condition	A	B	C	D
Pasture, grassland, or range — continous forage for grazing.	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow — continous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush — brush—weed—grass mixture with brush the major element.	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30	48	65	73
Woods — grass combination (orchard or tree farm).	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods.	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77
Farmsteads — buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

Table 2—2c. pg. 2—7 of 210—VI—TR—55, Second Ed., June 1986

Land Use Definition	Soil Group A	Soil Group B	Soil Group C	Soil Group D	Unclassified
High Density	89	92	94	95	93
Medium Density	77	85	90	92	87
Low Density	61	75	83	87	79
Open/Undisturbed	49	69	79	84	74

The Land Use Definitions are based upon the following conditions:

High Density	– 85% Impervious – Commercial
Medium Density	– 65% Impervious – 1/8 Acre lots
Low Density	– 38% Impervious – 1/4 Acre lots
Open/Undisturbed	– Grass cover on 50% to 75% of the area

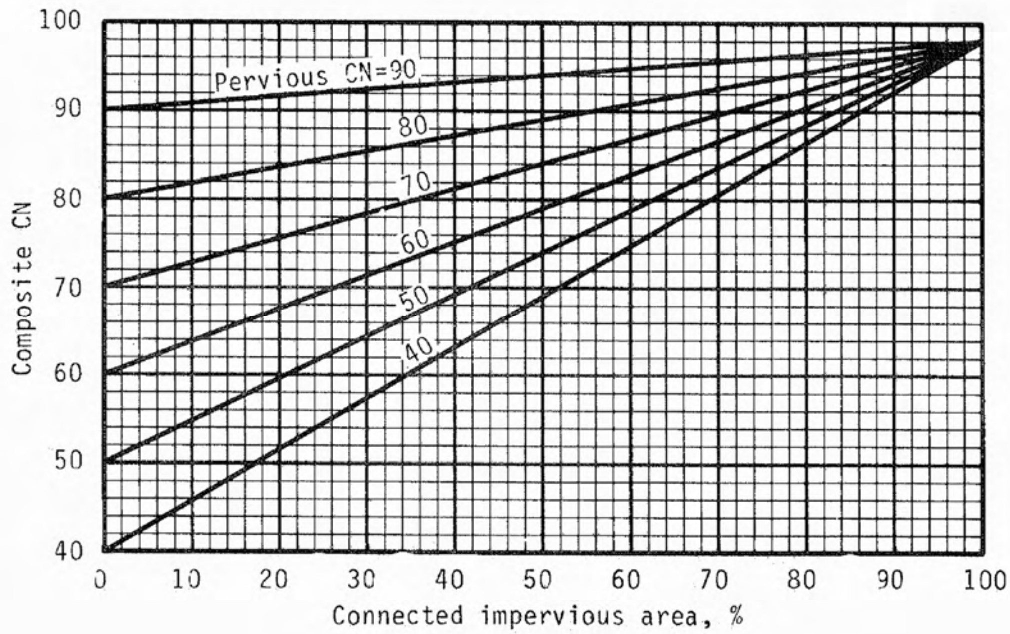


Figure 4-5 - NRCS Composite CN with connected impervious area

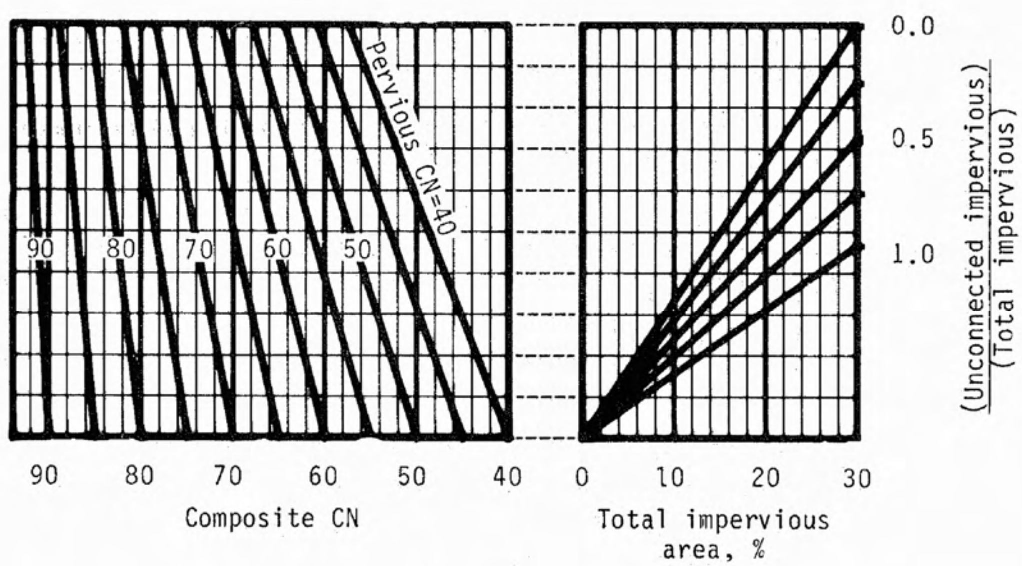


Figure 4-6 - NRCS Composite CN with connected impervious area and total impervious area less than 30%

EXHIBIT 10-7 PAGE 1
MANNING ROUGHNESS COEFFICIENTS, (n)

EFFECTIVE DATE: DECEMBER 2012

I. CLOSED CONDUITS: *

	Manning's n Range
A. Concrete pipe	0.012
B. Smooth wall PVC	0.011
C. Corrugated–metal pipe or pipe–arch:	
1. 2–2/3 by 1/2 in. corrugation (riveted pipe):	
a. Plain or fully coated	0.024
b. Paved invert (range values are for 25 and 50 percent of circumference paved:	
(1) Flowing full under pressure	0.021–0.018
(2) Flowing part full, depth 0.8D	0.021–0.016
2. 6 by 2 in. corrugation (field bolted)	0.030
D. Vitrified clay pipe	0.012–0.014
E. Cast–iron pipe, uncoated	0.013
F. Steel Pipe	0.009–0.011
G. Brick	0.014–0.017
H. Monolithic Concrete:	
1. Wood forms, rough	0.015–0.017
2. Wood forms, smooth	0.012–0.014
3. Steel forms	0.012–0.013
I. Cemented rubble masonry walls:	
1. Concrete floor and top	0.017–0.022
2. Natural floor	0.019–0.025
J. Laminated treated wood	0.015–0.017
K. Vitrified clay liner plates	0.015

II. OPEN CHANNELS, NONVEGETATED LINING, (Straight Alignment): *

A. Concrete, with surfaces as indicated:	
1. Formed, no finish	0.013–0.017
2. Trowel finish	0.012–0.014
3. Float finish	0.013–0.015
4. Float finish, some gravel on bottom	0.015–0.017
5. Gunite, good section	0.016–0.019
6. Gunite, wavy section	0.018–0.022
B. Concrete, bottom float finished, sides as indicated:	
1. Dressed stone in mortar	0.015–0.017
2. Random stone in mortar	0.017–0.020
3. Cement rubble masonry	0.020–0.025
4. Cement rubble masonry, plastered	0.016–0.020
5. Dry rubble (riprap)	0.020–0.030

		Manning's n Range
II.	(CONTINUED)	
C.	Gravel bottom, sides as indicated:	
	1. Formed concrete	0.017–0.020
	2. Random stone in mortar	0.020–0.023
	3. Dry rubble (riprap)	0.023–0.033
D.	Brick	0.014–0.017
E.	Asphalt:	
	1. Smooth	0.013
	2. Rough	0.016
F.	Wood, planed, clean	0.011–0.013
G.	Concrete–lined excavated rock:	
	1. Good section	0.017–0.020
	2. Irregular section	0.022–0.027
III.	HIGHWAY CHANNELS AND SWALES WITH MAINTAINED VEGETATION (Values shown are for Velocities of 2 and 6 f.p.s.): *	
A.	Depth of flow up to 0.7 foot:	
	1. Bermudagrass, Kentucky bluegrass, buffalograss:	
	a. Mowed to 2 inches	0.070–0.045
	b. Length 4–6 inches	0.090–0.050
	2. Good stand, any grass:	
	a. Length about 12 inches	0.180–0.090
	b. Length about 24 inches	0.200–0.100
	3. Fair stand, any grass:	
	a. Length about 12 inches	0.140–0.080
	b. Length about 24 inches	0.250–0.130
B.	Depth of flow 0.7–1.5 feet:	
	1. Bermudagrass, Kentucky bluegrass, buffalograss:	
	a. Mowed to 2 inches	0.050–0.035
	b. Length 4–6 inches	0.060–0.040
	2. Good stand, any grass:	
	a. Length about 12 inches	0.120–0.070
	b. Length about 24 inches	0.200–0.100
	3. Fair stand, any grass:	
	a. Length about 12 inches	0.100–0.060
	b. Length about 24 inches	0.170–0.090

IV. STREET AND EXPRESSWAY GUTTERS: *

	Manning's n Range
A. Concrete gutter, troweled finish	0.012
B. Asphalt pavement:	
1. Smooth texture	0.013
2. Rough texture	0.016
C. Concrete gutter with asphalt pavement:	
1. Smooth	0.013
2. Rough	0.015
D. Concrete pavement:	
1. Float finish	0.014
2. Broom finish	0.016
E. For gutters with small slope, where sediment may accumulate, increase above values of n by	0.002

V. OPEN CHANNELS, EXCAVATED OR DREDGED **

	Minimum	Normal	Maximum
A. Earth, straight and uniform	0.016	0.018	0.020
1. Clean, recently completed	0.018	0.022	0.025
2. Clean, after weathering	0.022	0.025	0.030
3. Gravel, uniform section, clean	0.022	0.027	0.033
B. Earth, winding and sluggish			
1. No vegetation	0.023	0.025	0.030
2. Grass, some weeds	0.025	0.030	0.033
3. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
4. Earth bottom and rubble sides	0.025	0.030	0.035
5. Stony bottom and weedy sides	0.025	0.035	0.045
6. Cobble bottom and clean sides	0.030	0.040	0.050
C. Dragline—excavated or dredged			
1. No vegetation	0.025	0.028	0.033
2. Light brush on banks	0.035	0.050	0.060
D. Rock cuts			
1. Smooth and uniform	0.025	0.035	0.040
2. Jagged and irregular	0.035	0.040	0.050
E. Channels not maintained, weeds and brush uncut			
1. Dense weeds, high as flow depth	0.050	0.080	0.120
2. Clean bottom, brush on sides	0.040	0.050	0.080
3. Same, highest stage of flow	0.045	0.070	0.110
4. Dense brush, high stage	0.080	0.100	0.140

VI. NATURAL STREAM CHANNELS: **

	Minimum	Normal	Maximum
A. Minor streams (top width at flood stage < 100 ft)			
1. Streams on Plain			
a. Clean, straight, full stage, no rifts or deep pools. . .	0.025	0.030	0.033
b. Same as above, but more stones and weeds	0.030	0.035	0.040
c. Clean, winding, some pools and shoals	0.033	0.040	0.045
d. Same as above, but some weeds and stones	0.035	0.045	0.050
e. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
f. Same as 4, more stones .	0.045	0.050	0.060
g. Sluggish reaches, winding, deep pools	0.050	0.070	0.080
h. Very winding reaches, deep pools, floodways with heavy stand of timber and underbrush	0.075	0.100	0.150
2. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stages			
a. Bottom: gravels, cobbles, few boulders	0.030	0.040	0.050
b. Bottom: cobbles with large boulders	0.040	0.050	0.070
B. Flood Plains			
1. Pasture, no brush			
a. Short grass	0.025	0.030	0.035
b. High grass	0.030	0.035	0.050
2. Cultivated area			
a. No crop	0.020	0.030	0.040
b. Mature row crops.	0.025	0.035	0.045
c. Mature field crops	0.030	0.040	0.050
3. Brush			
a. Scattered brush, heavy weeds	0.035	0.050	0.070
b. Light brush and trees in winter.	0.035	0.050	0.060
c. Light brush and trees in summer.	0.040	0.060	0.080
d. Med. to dense brush, in winter.	0.045	0.070	0.110
e. Medium to dense brush, in summer	0.070	0.100	0.160

VI. (CONTINUED)

4. Trees	Minimum	Normal	Maximum
A. Dense Willows, summer, straight	0.110	0.150	0.200
B. Cleared land w/ stumps, no sprouts	0.030	0.040	0.050
C. Same as b., with heavy growth of spouts	0.050	0.060	0.080
D. Heavy timber, a few down trees, little undergrowth, flood stage below branches	0.080	0.100	0.120
E. Same as d., with flood stage reaching branches .	0.100	0.120	0.160

C. Major Streams (top width at flood stage > 100 ft). The n value is less than that for minor streams of similar description, because banks offer less effective resistance.

	Minimum	Normal	Maximum
1. Regular section with no boulders or brush	0.025	*****	0.060
2. Irregular and rough section . . .	0.035	*****	0.100

* SOURCE:
KENTUCKY DEPARTMENT OF HIGHWAYS DESIGN MANUAL
EFFECTIVE DATE 3–77, EXHIBIT 2–507.1
MANNING ROUGHNESS COEFFICIENTS, n

** SOURCE:
KENTUCKY DEPARTMENT OF HIGHWAYS DESIGN MANUAL
EFFECTIVE DATE 01–01–93, EXHIBIT DR–05.901
MANNING ROUGHNESS COEFFICIENTS, n

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CHAPTER 11
PRIVATE DEVELOPMENT DRAINAGE
PLAN SUBMITTAL REQUIREMENTS

CHAPTER 11
PRIVATE DEVELOPMENT DRAINAGE PLAN SUBMITTAL REQUIREMENTS

11.1 PURPOSE

This chapter establishes the submittal requirements to the New Albany Stormwater Board and the Floyd County Stormwater Department for private development storm sewer projects. This chapter also summarizes the processes required by the City of New Albany and Floyd County for approving a private development project. See Chapter 13 "Development Sanitary Sewer Construction" for the New Albany Sewer Board approval process and submittal requirements for private development sanitary sewer projects. Storm sewer systems should be designed in accordance with the applicable provisions of this and other chapters of the New Albany/Floyd County Design Manual.

11.2 NEW ALBANY STORMWATER BOARD/FLOYD COUNTY STORMWATER DEPARTMENT REVIEW

The drainage facilities for a proposed development in New Albany must be reviewed and approved by the New Albany Stormwater Board. The drainage facilities for a proposed development in Floyd County must be reviewed and approved by the Floyd County Stormwater Department. The applicant shall meet with the Stormwater Board or Stormwater Department during the planning phase of development to discuss the feasibility of the storm sewer design before creating final construction plans.

11.2.1 Preliminary Review

A meeting should be arranged with the developer and the New Albany Stormwater Board or Floyd County Stormwater Department to discuss a preliminary plan and if sufficient downstream capacity is available. A preliminary plan shall be submitted on a 24" x 36" drawing identifying the limits of the project. The preliminary plan should generally show a location map, the lot layout with topography, drainage areas in each segment, proposed storm sewer alignment, proposed detention basin location with preliminary volume calculations, the existing storm sewer, and the discharge points. The Stormwater Board/Stormwater Department will review the submittal, primarily examining the development for the following:

A. Potential impacts to upstream, downstream, and adjacent properties.

B. Adequacy of drainage system outlet.

C. Public outlet for drainage.

D. Floodplain impact.

E. Erosion Prevention and Sediment Control.

F. Adherence to any applicable drainage master plan criteria.

In New Albany or Floyd County the developer should consult with the New Albany Stormwater Board or the Floyd County Stormwater Department prior to submitting preliminary plans. The purpose is to confirm adherence to applicable drainage criteria and insure the downstream drainage system has adequate capacity.

11.2.2 Final Review

Final plans shall include the following items:

A. Drainage Construction Plans and Specs

Two copies of the final drainage plans shall be submitted on 24”x36” size sheets as well as one digital copy containing both AutoCad and PDF file formats. One hard copy and one digital copy of the storm sewer specifications shall also be submitted. A Professional Engineer and/or Professional Land Surveyor (where applicable per IC 25-21.5-1-7) licensed in the State of Indiana shall seal, sign, and date each sheet of the drainage plans. A Professional Land Surveyor, licensed in the State of Indiana, shall seal, sign, and date any sheets with Boundaries shown. Drafting standards shall be according to Chapter 4 “CADD Standards” of this design manual.

The use of the standard details located in Appendix A of this manual is required. Nonstandard details and deviations from the standard details must be shown within the plan set. Deviations from the standard details must be approved by New Albany or Floyd County.

B. Drainage Calculations

The drainage design calculations shall be as described in Chapter 10 “Stormwater Facilities Design” of this design manual and shall be included in the final submittal. New Albany or Floyd County may require improvements to downstream facilities in order to accommodate the flow from the proposed development.

C. Approval by IDEM (if required)

For developments requiring IDEM approval, a copy of the permit and permit approval letter shall be submitted to the New Albany Stormwater Board or Floyd County Stormwater Department.

D. Correspondence with other Utilities

Documentation must be provided showing that potential conflicts with existing utilities have been addressed to the satisfaction of the utility company. New Albany or Floyd County must be copied on all letters and transmittals to and from the various utility companies.

E. Other Permits

Documentation must be provided showing that all applicable permits have been obtained for the construction of the project, such as encroachment permits, railroad crossing permits, and New Albany/Floyd County shall be copied on all letters and transmittals to and from the various regulatory agencies.

F. Easement Plats (if required)

Two copies of any sewer and drainage easement plats required for the proposed development shall be included with the final submission of documents. Easement Plats shall be recorded prior to construction approval.

G. Record Plat

A copy of the record plat for the development must be submitted in order for New Albany or Floyd County to determine whether or not additional sewer and drainage easements will be required. The Developer shall record the Record Plat.

H. Erosion Prevention and Sediment Control (EPSC) Plan

The developer must submit a plan for erosion prevention and sediment control (EPSC) as part of their plan set. The EPSC plan must include the actual depths and locations of all control measures. The EPSC plan must be stamped and sealed by an Indiana licensed Professional Engineer or Professional Land Surveyor (where applicable per IC 25-21.5-1-7). See Chapter 8 "Erosion Prevention and Sediment Control" for EPSC measures.

11.2.3 Construction Phase

The New Albany Stormwater Board or Floyd County Stormwater Department will issue an approval letter after all final design submittal requirements are provided and deemed satisfactory. This letter is the notice to proceed, and construction of the storm sewer must commence within one year of approval.

A. Bonds

New Albany requires that a Performance Bond be posted covering the cost of sewer facilities construction during construction. New Albany will require that a Maintenance Bond be posted in the amount calculated by New Albany ($5,000.00 minimum plus $50 per LF under roads and $25 per LF outside of pavement). After the project has been accepted by New Albany, a one-year warranty period begins. If there are no problems with the facilities after one year, New Albany will release the bonds.

B. Accepted Bid Proposal

New Albany requires that the lump sum cost for the construction of the sanitary sewers be submitted. The lump sum amount shall be the same as the amount shown on the Performance Bond.

C. Drainage Facilities Contract

The developer agrees to construct the project according to the plans and specifications and to furnish record drawings once the job is finished. In the case that New Albany/Floyd County desire to take ownership of the facilities a Drainage Facilities Contract will be prepared by New Albany or Floyd County. This document is the legal agreement between the developer and New Albany/Floyd County regarding the construction of drainage facilities. It conveys the drainage facilities to New Albany/Floyd County upon completion and acceptance by New Albany/Floyd County.

D. Inspector

The New Albany Stormwater Board or Floyd County Stormwater Department will provide part-time inspection as-needed for the construction of all drainage systems. Construction of storm sewers shall not begin in a development until an inspector has been assigned to the construction site. New Albany or Floyd County requires a three (3) working day advanced notice to schedule an inspector for a project.

E. Construction Field Changes

Final approved construction plans bearing the Engineer's original seal, signature, and date are required prior to beginning storm drainage construction

Deviations from approved construction plans as a result of unexpected field conditions will require documentation and approval by the New Albany Stormwater Board or Floyd County Stormwater Department. To obtain this approval, the contractor shall submit three (3) copies of the marked-up REDLINE plans showing the proposed revisions. Upon acceptance of the changes, the New Albany Stormwater Board or Floyd County Stormwater Department will mark the REDLINE drawings approved, sign and date the approval and send the REDLINES to the construction site via the inspector. One copy will be for the contractor, one copy for the inspector and one copy for the New Albany Stormwater Board or Floyd County Stormwater Department file.

F. Close-Out Procedures

After completion of the storm sewer installation, and appropriate restoration of the disturbed area has been completed in accordance with the Erosion Prevention and Sediment Control Plan, and all other close out criteria are met, the New Albany Stormwater Board or Floyd County Stormwater Department will accept the storm sewers as complete.

G. Record Plans

At the completion of construction, final record (as-built) drawings of the construction plans bearing the Land Surveyor's and/or Professional Engineer’s original seal, signature, and date, and incorporating all approved changes shall be submitted to the New Albany Stormwater Board or Floyd County Stormwater

Department. Final record drawings shall be prepared in accordance with Chapter 5 "Final Record Drawings" of this manual. The developer shall submit one hard copy of the final record drawings and one electronic copy containing both AutoCAD and PDF file formats. New Albany's or Floyd County's inspector will coordinate and check the work prior to submitting the record drawings to the New Albany Stormwater Board or Floyd County Stormwater Department. Record plans shall be sent to the following address:

New Albany Stormwater Department
2113 Grant Line Road
New Albany, IN 47150
Phone Number: (812) 945-1989
or
Floyd County Stormwater Department
Pine View Government Center
2524 Corydon Pike, Suite #201
New Albany, IN 47150
Phone Number: (812) 945-9936

11.3 MINIMUM CONSTRUCTION PLAN SUBMITTAL STANDARDS

11.3.1 Subdivision Plans

Subdivision Plans for the development of more than four (4) lots require dedication of roadways for access.

All plans must be submitted on 24" x 36" inch sheets.

11.3.1.1 Cover Sheet

A. Location Map with the site outlined.

B. Title Block: Title of Subdivision, name and address of developer; name, address and email address of Engineer; date of preparation; revision dates.

C. Index of Sheets and Legend.

D. Engineer's and Land Surveyor's seals, signatures, and dates.

E. Utility Notes.

11.3.1.2 Composite Drainage Plan

A. Topography

Minimum Scale 1" = 100' with existing and proposed contours at 2-foot intervals, NAVD 88 datum. Contours to extend a minimum of 50 feet beyond property lines.

B. Proposed Development

Street rights-of-way, street names, street centerline stationing, lot lines, lot numbers, property boundary, existing drainage structures, proposed drainage structures (labeled by number or other designation) and easements with widths shown.

C Hydrologic Data

Designate pre-development and post-development drainage areas (in acres) to individual inlets, and off-site drainage areas (acres), which generate through drainage.

D. Pipe Chart

Pipe number, drainage area, coefficient of runoff (c), time of concentration, intensity, discharge (Q), size, length, slope, capacity, velocity, and headwater depth for both the 10-year and 100-year flows.

E. 100-year FEMA floodplain and floodway, if applicable, with flood elevations noted.

F. Identification of outlet system.

11.3.1.3 Grading and Erosion Prevention and Sediment Control Plan

A. Existing and Proposed Contours.

B. Erosion Prevention and Sediment Measures (Reference Chapter 8 and EPSC Checklist).

C. Proposed Development

Street rights-of-way, street names, street centerline stationing, lot lines, lot numbers, property boundary, existing drainage structures, proposed drainage structures (labeled by number or other designation) and easements.

D. Grading Plan may be combined with Composite Drainage Plan provided the plan remains legible.

E. Areas of slope greater than or equal to 30% shall be identified.

F. Stream Buffers if applicable.

G. Limits of disturbance and number of acres disturbed.

11.3.1.4 Plan and Profile (Road) Sheets

Plan View

A. Catch Basins

Line and station number (structure number), grate type and elevation, and invert elevation.

B. Pipe Designation

Length, size, type, slope, pipe number.

C. Headwalls

Type, invert elevation.

D. Ditches and Swales

Type, stations.

E. Easements

Type, size, existing easements labeled with deed book and page numbers or instrument number.

F. Utilities

Existing and proposed (including sanitary sewers.)

G. Other drainage structures to be labeled accordingly.

Profile View

A. Storm lines and structures to be shown on road profiles.

B. Utility and sanitary sewer crossings.

11.3.1.5 Storm Drainage Profiles (pipes, ditches, box culverts)

A. Catch Basins

Station or number, type, grate type and elevation, invert elevation, and headwater elevation (10 and 100 year).

B. Pipes

Length, size, type, class, grade, line number if applicable, HGL (10 and 100 year).

C. Ditches

1. Type
2. Grade
3. Flow line elevation at grade changes
4. Design Depth
5. Mannings "n"
6. Slope
7. 10 and 100 year discharge depths
8. Channel Shear Stress

D. Headwalls

Type and invert elevation.

E. Existing and proposed ground surfaces.

11.3.1.6 Standard Detail Sheet

Refer to Appendix A in this Design Manual for Standard Details. Any detail not covered in the appendix must be approved by the New Albany Stormwater Board or Floyd County Stormwater Department.

11.3.1.7 Additional Submittal Items

A. Quantities - Detailed breakdown of all items, related to storm drainage construction needed to determine the amount of the subdivision bond.

B. Approved Preliminary Plan - including sanitary sewer layout.

C. Clearing and Grading Plan - required if site clearing and grading is to precede approval.

D. Detention Basin Calculations - if applicable and in accordance with the provisions of Chapters 10 and 11 of this design manual.

E. Highway Encroachment Permit - (if applicable) from the Indiana Department of Transportation.

F. Section 404 Permit - (if applicable) from the U.S. Army Corps of Engineers.

G. Section 401 Water Quality Certification Permit - (if applicable) from the Indiana Department of Environmental Management.

H. Application for Culverts and Stream Crossings Permit - from the Indiana Department of Environmental Management.

I. Other required permits not identified here.

11.3.1.8 Submittal

Two sets of 24” x 36” construction plans and specifications are to be submitted for initial review.

11.3.2 All Other Development Plans (Site, etc.)

11.3.2.1 Existing Topography Plan

This plan shall conform to Chapter 4 of this design manual with the following additional data:

A. Spot elevations at critical points.

B. 100-year FEMA floodplain and floodway, if applicable, with flood elevations noted.

C. Off-site drainage area in acres, which generate through drainage.

11.3.2.2 Proposed Development and Grading Plan

This plan may be combined with the plan described in paragraph 11.3.2.1 if existing features can still be discerned. This plan shall include the following additional data:

A. Revised hydrologic data, runoff calculations, and detention basin design, if applicable.

B. Hydraulic data, such as pipe charts and ditch data on profiles, showing quantity of flow, velocities, and degree of protection.

C. Erosion prevention and sediment control measures and details.

D. Show public outlet and evaluate capacity of downstream facilities.

E. Proposed easements for through drainage, detention facilities, and/or offsite increase in runoff.

F. Note specific conflicts with other utilities.

G. Written explanation of any proposed deviation from policies, standards, or design criteria and any supplemental data that would aid the understanding of the proposed plan work.

H. The stamp of a professional engineer licensed in Indiana shall be affixed to the plan when the proposed facilities affect public drainage, downstream properties, floodplains or detention.

11.4 INSPECTION OF SUBDIVISION CONSTRUCTION

11.4.1 General

New Albany or Floyd County will provide on-site inspection for the construction of public drainage systems in public rights-of-way or public easements. Drainage construction may begin following approval of the construction plans and issuance of all permits as described in Chapter 2.

11.4.2 Inspector Assignment

Construction of drainage structures and pipes shall not begin in a development until an inspector has been assigned to the construction site by New Albany or Floyd County. In certain situations, which will be identified during construction plan review, full-time inspection may be required. In the event that inspection personnel are not available to provide the level of inspection necessitated by a contractor's schedule, the owner may retain (at the owner's expense) an independent inspector working under the direct supervision of a professional engineer. The independent inspector will be required to certify that the materials and methods of construction are in compliance with the approved plans. Arrangements for owner-provided inspection including schedule and level of effort must be approved in advance.

Three working days notice is required to schedule an inspector for a project. To schedule an inspector, please contact New Albany or Floyd County at:

New Albany Stormwater Department
2113 Grant Line Road
New Albany, IN 47150
Phone Number: (812) 945-1989
or
Floyd County Stormwater Department
Pine View Government Center
2524 Corydon Pike, Suite #201
New Albany, IN 47150
Phone Number: (812) 945-9936

11.5 FEES

11.5.1 Plan Review Fees

Plan review is done by an independent consultant under contract to New Albany. The developer will pay plan review fees directly to this consultant. All fees must be paid prior to approval of the plans. The fee is a flat rate, which includes the review of the original submittal and one (1) resubmittal. If additional submittals are needed, the developer will be billed for time and expense. Additional fees may be required for large sites or with extensive review of hydrologic and hydraulic modeling. Floyd County plan reviews are conducted by county staff.

11.5.2 Stormwater Fees

11.5.2.1 Regional Facility Fee

This is a stormwater impact fee, paid by the developer on sites where New Albany or Floyd County has determined on-site detention will not be required. This fee allows the developer to pay a proportionate share of the cost of constructing Regional Stormwater Detention Facilities.

11.5.3 Compensation Fees

Fees are applicable to sites in floodprone watersheds where runoff volume compensation is required.

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CHAPTER 12
SANITARY SEWER SYSTEMS

12.1 PURPOSE

This chapter establishes the minimum standards and technical design criteria for sanitary sewer systems in the New Albany service area for Capital Improvement and development projects. Adherence to these standards will expedite review and approval of plans. Hydraulic design presented herein represents acceptable procedures not necessarily to the exclusion of other sound and technically supported design procedures. Any departure from these design requirements should be brought to the attention of New Albany before submission of plans for approval and should be justified and documented. Sanitary sewer plan preparation for private development must also conform to Chapter 13 requirements and in all cases plan development shall conform to the Chapter 8 EPSC requirements.

The City of New Albany is currently under a sewer tap-on ban imposed by the Indiana Department of Environmental Management (IDEM). Sanitary sewer credits must be secured from the New Albany Sewer Board and IDEM prior to design approval and connection to the sewer system.

12.2 BASIC ELEMENTS

The design of sanitary sewers basically consists of the determination of the following:

A. The location of the horizontal alignment, which most efficiently provides service to existing and potential users.

B. The vertical restrictions on establishing the sewer alignment including: depths required to serve users, minimum cover, elevations of other sewers in the system, conflicts with other underground facilities, solid rock considerations, and maintaining the required hydraulic gradients.

C. The design flow generated by the existing and future users, which must be transported by the sewer.

D. The pipe size, pipe material, bedding and method of construction required.

E. The necessary appurtenances and special structures required.

12.3 GENERAL LOCATION CRITERIA

Sewers shall be located using sound engineering judgment to determine the most cost-effective and environmentally sensitive alignment that best serves the needs of the entire tributary area. Additionally, it is imperative that all alternatives worthy of consideration receive maximum and equal consideration with regard to environmental impact. The costs and acquisition time for easements can be significant; therefore, sewers should be located within existing easements and rights-of-way whenever feasible and practical.

When selecting the sewer alignment, consideration should be given to the following general location criteria:

A. Elevation requirements necessary to provide appropriate service with due consideration of sanitary facilities in basements.

B. For protection of environmentally sensitive areas and constraints such as creeks, wetlands, trees, protected habitats, etc.

C. Existing utilities, railroads, highways, and overhead facilities.

D. Location of other existing and proposed sewerage and stormwater facilities.

E. Property values, easement needs and potential damages to the affected properties.

F. Existing and proposed high water elevations, including high water for appropriate design periods.

G. Anticipated extension of existing streets and the potential for the development of contiguous areas.

H. Continuity with adjacent design segments.

I. Maintenance of traffic.

J. Availability of materials.

K. Foundation conditions.

L. Construction cost.

The location of proposed sanitary sewers should also comply with the Indiana Administrative Code 327 IAC 3 Rule 6 "Technical Standards for Sanitary Collection Systems", Sections 9 and 10.

12.4 HORIZONTAL ALIGNMENT CRITERIA

12.4.1 General

All sewers shall be constructed with a straight alignment between manholes. Sewers shall be located in yards in a sanitary sewer and drainage easement adjacent to the road right-of-way and shall be at least 10 feet from the water main. The manholes shall be completely outside the pavement and not partially in the pavement, unless approved by the Sewer Board. The centerline of the manhole shall be a minimum distance of 3 feet from the edge of pavement, and a minimum distance of 5 feet inside the sanitary sewer and drainage easement.

12.4.2 Sewers Located under Pavement (Subject to Approval by Sewer Board)

Construction of sewers under pavement will be subject to approval by the Sewer Board. If circumstances require the sewer to be located under the roadway, the sewer shall be located in the traffic lane on the opposite side of the street and at least 10 feet away from the water main with the centerline of the sewer to be a minimum of 5 feet from the edge of pavement. Every effort shall be made to place the entire manhole frame and cover entirely within the pavement. In areas where this location will conflict with gas and water valves or other utilities, the sewer location shall be adjusted to avoid these conflicts. Consideration of other factors, such as the width of the pavement, depth of rock, and possible conflict with other utilities, will still be required so the sewer can be built without modification during construction. In areas where concrete pavement is encountered, consideration shall be given to placing the sewer in a location whereby one edge of the pavement to be removed would coincide with existing construction joints, which are generally in the centerline of the streets. This procedure would require that only one side of the pavement would have to be sawed for removal. In areas where lots slope abruptly away from the street, consideration shall be given to locating the sewer near the property line on the low side.

12.4.3 Stationing

All sewer stations shall increase upstream. Every effort shall be made to begin the stationing of a sewer with Station 0+00.00 at the downstream end. When an existing sewer is to be extended, the stationing should be continued from the end of the existing sewer whenever possible. The PI stations and deflection angles or interior angles shall be shown on the plans at all changes in alignment.

12.4.4 Sewer Designations

The designation of the first sewer in a collection system shall be LINE "A". The next sewer upstream contributing to LINE "A" shall be designated LINE "B", and the station of LINE "B" at this point shall be Station 0+00.00. This method shall continue throughout the collection system and subsequent sewers shall be assigned appropriate designations by ascending letters. Lines beyond LINE "Z" shall continue with double letter designations starting with LINE "AA", "AB", etc. For very short segments not extending beyond one manhole, designations such as LINE "B-1" will be allowed.

12.5 VERTICAL ALIGNMENT CRITERIA

12.5.1 Sewer Depths

Sanitary sewers shall have a minimum cover of 4 feet in easements and a minimum cover of 5 feet in rights-of-way. Specific exceptions to these minimum requirements may be made with prior approval by New Albany.

In developed areas, the criteria, discussed in Section 12.8.3, should be used to establish the flow line of the sewer unless otherwise directed by New Albany. The "Service Connection Survey" form, found on Exhibit 6-1, should be used when determining the controlling elevations of a sanitary sewer line. In instances where only a few houses on a sanitary sewer have existing basement facilities, the impact on the entire system shall be considered prior to providing gravity basement service. Additionally, in areas having substantial amounts of solid rock, consideration shall be given to the omission of basement service. This omission must be approved in writing by New Albany.

In establishing the elevation of the proposed sanitary sewer, the elevations of existing and proposed interceptor sewers and the elevations of inflow pipes to existing pump stations and wastewater treatment plants and all other utilities shall be considered.

A minimum cover of 2 feet shall generally be maintained when crossing under existing streams, existing ditches, and existing or proposed channel improvements and storm sewers, provided the sanitary sewer line is encased in concrete (or capped if approved by New Albany). With respect to streams, restoration of the channel invert will conform to the applicable standard drawings (EC-01-01, EC-02-01, or EC-03-01) located in Appendix A.

The sanitary sewer elevation necessary to serve the entire tributary area shall be considered in establishing the upstream flow line of any sanitary sewer segment including the area beyond the boundary of a design section.

A separate parallel sanitary collector sewer shall be considered in lieu of individual property service connections into the interceptor sewer in areas where the sanitary interceptor sewer reaches excessive depths. The collector sewer, at a higher elevation, should end in a drop manhole or vertical stacks into the interceptor sewer. A cost-effectiveness study shall be submitted to New Albany for review and approval.

12.5.2 Sewer Gradients

All sewer gradients shall be referenced to the North American Vertical Datum of 1988. When connecting into or extending existing sewer facilities that were constructed using another datum, an elevation equation should be shown on the plans. The hydraulic criteria, established in Section 12.9, should be used to determine sewer flow line elevations in manhole structures.

12.5.3 Flooding and Ponding Areas

In general, the top of sanitary manhole elevations shall be a minimum of 2 feet above existing, proposed, or projected 100-year high water elevations. However, when this minimum elevation causes the manhole to be above the natural ground creating obstructive mounds, the top of the manhole elevation shall be lowered to the natural ground elevation and a watertight manhole lid and frame shall be specified.

12.5.4 Minimum Water Main Clearances

The following minimum clearances between the sewer and existing or proposed water mains shall be used in establishing the sewer alignment:

12.5.4.1 Horizontal Clearance

The horizontal clearance shall be 10 feet minimum per the Indiana Administrative Code 327 IAC 3-6-9 “Separation of collection systems from water mains and drinking water wells.” Where this is not possible, the Design Engineer should reference 327 IAC 3-6-9 for exceptions.

12.5.4.2 Vertical Clearance

The vertical clearance shall be at least 18 inches per the Indiana Administrative Code 327 IAC 3-6-9 “Separation of collection systems from water mains and drinking water wells.” The sewer shall be located <u>below</u> the water main. Should it become necessary for the sewer to cross over the water main, special precautions and exfiltration testing of the sewer will be required. Such cases shall require written approval by New Albany and IDEM.

12.6 GENERAL PROCEDURES

The design flow for each segment of the sewer system shall be determined as follows:

A. Prepare a Drainage Map, which defines the area’s tributary to each element of the sewer.

B. Examine each area to determine its potential land use.

C. Determine the average daily flow.

D. Determine the design or peak flow based upon the average daily flow and the peaking factor.

12.7 DRAINAGE MAP REQUIREMENTS

A Drainage Map shall be prepared showing the actual area to be served by the proposed project, the location of the sewers, the portion of the project area tributary to each individual sewer element, and any points of inflow which contribute additional flow from adjacent areas. The Drainage Map shall be prepared on a standard size sheet at an appropriate scale to show the entire project and adjacent future contributing areas. Two or more sheets may be used for large-scale projects. A sample Drainage Map is shown on Exhibit 4-10. The purpose of the Drainage Map is to graphically depict the basis for the design flow calculations. The Drainage Map and design calculations shall be presented for review with submittal of the preliminary and construction plans. The minimum specific information required includes the following:

A. A key map showing the general location of the project area, including any areas not within the project area that contribute to the proposed system.

B. A general layout of the proposed system with the drainage area tributary to each major element of the system defined.

C. The basis for determining the number of existing and future users and the average daily flow for each drainage area: i.e., the number of single-family or multi-family dwelling units; type and size of existing commercial, industrial and institutional users; and the number of acres of undeveloped land by zoning classification.

D. A zoning designation, such as R1, for each drainage area.

E. A designation for each sewer line.

F. A numbering system for manholes, which shall be added to the computation sheets. Contact Sewer Department at Ph. 948-5320 for manhole numbers.

G. All proposed sewer sizes.

H. The location of estimated or actual flow entering the proposed system from outside areas, developed or undeveloped. These areas are to be shown in their entirety on the Drainage Map and shall include the same types of information required for the proposed service area.

I. An adequate number of spot elevations must be obtained in areas of undeveloped land to show the natural drainage of the area if necessary.

J. An indication of the existing system's ability to receive the proposed flow with sufficient capacity.

12.8 DESIGN FLOW CRITERIA

12.8.1 Collector Sewers

Collector sewers are primarily installed to receive wastewater directly from property service connections. A major change in land use within a tributary area can have a significant impact on the collector system's ability to transport the necessary flow. Collector sewers should be designed to transport the peak daily flow (at 2/3 pipe full), which might be expected during their service life. The design flows should be calculated as described in Section 12.8.3.

12.8.2 Interceptor Sewers

An interceptor sewer is a principal sewer to which collector sewers are tributary. All interceptor sewers should be designed for peak daily flow (flowing 2/3 full) unless otherwise directed by New Albany.

For a major industrial water user or for undeveloped industrial land in the tributary area, New Albany will generally specify the estimated average daily flow. Otherwise, a flow of 10 persons per acre shall be assumed for all industrially zoned land (see Exhibit 12-2), except in areas where specific reliable information is available to more correctly analyze the anticipated flows.

12.8.3 Design Flows

The average daily flow and peak daily flow rates used in the design of a collector and interceptor sewer shall be equal to any upstream flows (if applicable) plus the flow from proposed service connections and any future flow from potential land development. Design flows for residential and commercial services shall be estimated in accordance with the Indiana Administrative Code 327 IAC 3-6-11 "Design flow rate requirements for collection systems and water pollution treatment/control facilities" and as described in Sections 12.8.3.1 and 12.8.3.2 hereinafter. Determining design flows for undeveloped land that could discharge into the proposed sewer in the future is described in Section 12.8.3.3.

12.8.3.1 Residential Service Connections

A general average daily flow rate value can be used to determine the average daily flows for residential service connections. The following equation shall be used to calculate average and peak daily flow rates for residential services:

$$ADF = \text{General Average} \times PRSC$$
$$PDF = ADF \times PF$$

Where:

ADF = Average daily flow rate expressed as gallons per residential service connection per day.

General Average = General average daily flow rate value in accordance with the following:

1 bedroom apartment = 200 gpd/unit
2 bedroom apartment = 300 gpd/unit
Single-family home = 310 gpd/unit

PRSC = Proposed number of residential service connections.

PDF = Peak daily flow rate expressed as gallons per residential service connection per day.

$$PF = \text{Peak daily factor} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Where P = population in thousands.

If the population is unknown, a peaking factor of 4 shall be used.

12.8.3.2 Commercial Service Connections

To determine the average daily flow and peak daily flow rates for service connections other than residential, the number of service connections can be multiplied by the applicable flow calculation factor listed in Table 11-1 of the Indiana Administrative Code 327 IAC 3-6-11 “Design flow rate requirements for collection systems and water pollution treatment/control facilities”. The following equation can be used to calculate the average and peak flow rates:

$$ADF = FCF \times PSC$$
$$PDF = ADF \times PF$$

Where:

ADF = Average daily flow rate expressed as gallons per service connection per day.

FCF = Flow calculation factors as listed in Table 11-1 of 327 IAC 3-6-11 expressed as gallons per day.

PSC = Proposed number of service connections.

PDF = Peak daily flow rate expressed as gallons per service connection per day.

PF = Peak daily factor = $\dfrac{18 + \sqrt{P}}{4 + \sqrt{P}}$

Where P = population in thousands.

If the population is unknown, a peaking factor of 4 shall be used.

12.8.3.3 Future Development

An estimate of the average daily flow and peak daily flow rates for future development shall be made by multiplying the average daily flow per acre listed in Exhibit 12-2 for the applicable zoning district by the number of acres of undeveloped land. For zoning districts that allow single family and multi-family dwellings and it is unknown which type of development will occur in the future, then the higher of the two flows shall be selected for that zoning district. The following equation shall be used to calculate the average and peak flow rates:

$$ADF = \text{Average Flow} \times \text{Acreage}$$
$$PDF = ADF \times PF$$

Where:

ADF = Average daily flow rate expressed as gallons per day.

Average Flow = Average daily flow rate as listed in Exhibit 12-2 in gallons per acre per day.

Acreage = Acres of undeveloped land per zoning district.

PDF = Peak daily flow rate expressed as gallons per day.

PF = Peak daily factor = $\frac{18 + \sqrt{P}}{4 + \sqrt{P}}$

Where P = population in thousands.

If the population is unknown, a peaking factor of 4 shall be used.

12.9 HYDRAULIC DESIGN CRITERIA

12.9.1 General

Manning's Equation shall be used to determine proper pipe size and slope to transport the design flow. Design shall be for two-thirds (2/3) pipe flow at saturation conditions with the following characteristics:

A. Roughness coefficient – n = 0.013 (Sanitary Sewers Only)

B. Minimum velocity – v = 2 feet/second

C. Minimum pipe size – D = 8 inches

D. Minimum allowable slopes = (See Exhibit 12-3)

Saturation conditions are defined as the maximum projected population for the watershed based on present zoning.

12.9.2 Hydraulic Grade Line

The hydraulic grade line should not rise above the crown of the sewer pipe. When critical, the hydraulic grade line shall be computed to show its elevation at manholes, transition structures, and junction points of flow in pipes and provide for the losses and the differences in elevation. If velocity entering a manhole is above critical, the hydraulic grade line must be computed to ensure that no service connections are surcharged. The pipe exiting the manhole must be adjusted in elevation to ensure that the energy gradient remains level across the manhole.

12.9.3 Velocity

All sanitary sewers shall be designed to carry the design flow at a minimum velocity of 2.0 ft/s (Reference paragraph 12.9.4 for exceptions). The maximum allowable design velocity shall be 15 ft/s based on the design flow. When severe topographic or unusual conditions require a design velocity greater than 15 ft/s, the hydraulic design and pipe material must be approved in writing by New Albany.

12.9.4 Minimum Slopes

The minimum allowable slopes will be as required to obtain the minimum velocity as required in Section 12.9.3. In no case shall the slopes be less than those identified in Exhibit 12-3 (stubs shall have a minimum slope of 0.005 ft/ft).

Note: For 8" pipe the minimum slope is 0.007 ft/ft (based upon pipe at one-fourth full depth) in cases where the minimum required velocity, at design flow, cannot be achieved at a lesser slope.

12.9.5 Sewer Size Changes

Sewer size changes shall only take place within a manhole or junction box structure. To ensure that the energy gradient is maintained, use the following:

A. Pipes 24" in Diameter or Smaller

1. When increasing the sewer size by 6 inches or less, crown elevations shall match at the centerline of the manhole.

2. When increasing the sewer size by more than 6 inches, the springlines of the smaller and larger sewer shall match at the centerline of the manhole. However, if the hydraulic design calculations show unacceptable losses resulting in a surcharge condition, the Design Engineer may match crown elevations at the centerline of the manhole by raising the elevation of the smaller sewer.

B. Pipes 27" in Diameter or Larger

Manholes or junctions involving sewers 27 inches or larger shall first be designed by matching the crown elevation at the centerline of the structure. The hydraulic grade line shall then be determined. If the Hydraulic Grade Line (HGL) shows a surcharging condition, the downstream pipe may be lowered as needed.

12.10 HYDRAULIC COMPUTATIONS

Exhibit 12-1 is a sample computation sheet for designing interceptor and collector sewers. The procedure used in completing this form can be found at the bottom of the Exhibit. This computation sheet, or similar form, shall be submitted with the plans for review. A copy of the computation sheet can be downloaded from the New Albany website:

www.cityofnewalbany.com.

12.11 SEWER PIPE

12.11.1 Minimum Diameter

The minimum allowable inside diameter for sewer pipe, other than property service connections, shall be 8 inches. All property service connections shall have a minimum inside diameter of 6 inches; commercial or industrial connections shall be individually considered with the minimum size of 6 inches.

12.11.2 Pipe Material

Pipe material will be selected from the following products. Alternate products can be specified by the designer, but prior approval from New Albany will be required. Designers will indicate the pipe material and pipe class on the plans. Approved products from the design manual that are not advantageous for a particular project and not allowed will need to be identified in the Contract (must be approved by New Albany).

A. **Concrete Pipe:** Concrete pipe 60 inches in diameter and larger shall be allowed on a case-by-case basis after approval by New Albany. If allowed, reinforced concrete pipe shall meet the requirements of ASTM C76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe. Unless shown otherwise on the Plans or required by the Contract, Class III, Wall B or thicker pipe shall be used.

   Cement used in the manufacture of reinforced concrete pipe shall meet the requirements of ASTM C 150, Standard Specification for Portland Cement, for Type II cement. All reinforcing cages shall be circular; elliptical reinforcement shall not be permitted unless shown on the Plans or allowed by New Albany. Joints shall be sealed with Type A - rubber compression or confined O-ring or other New Albany approved gaskets. Joints shall meet the requirements of ASTM C 443-05A, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

   Unless otherwise directed by New Albany, T-branch and Y-branch fittings shall be manufactured at the pre-cast plant and supplied to the Project site as single units. When field-fabricated branches are permitted, the openings in the pipe shall be properly cast at the time of manufacture.

B. **Ductile Iron Pipe and Fittings:** Ductile iron pipe shall meet the requirements of ANSI/AWWA C151/A21.51, Ductile Iron Pipe, and Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids. Unless shown otherwise on the Plans or in the Contract, the thickness class shall be determined based on a working pressure of 150 psi, in accordance with ANSI/AWWA C150/A21.50, Thickness Design for Ductile Iron Pipe.

   Flanged joint ductile iron fittings shall meet the requirements of ANSI/AWWA C110/A21.10, Ductile Iron and Gray Iron Fittings, 3 inch through 48 inch for Water and Other Liquids. At a minimum, Class 250 fittings with class 53 wall thickness shall be used.

Mechanical, push on and other such joints shall meet the requirements for ductile iron fittings, ANSI/AWWA C153/A21.53. Where these short bodied compact fittings are to be fitted to aged existing cast iron pipe of larger diameter than specified in A21 standards, mechanical joint sleeves or bell-and-spigot sleeves shall provide transition.

All pipe and fittings shall be cement-lined in accordance with ANSI/AWWA C104/A21.4, Cement-Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, or polyurethane lined over concrete or ductile iron or gray iron pipe and fittings. The polyurethane lining shall be an ASTM Type V, chemical cure, 100% solids, elastomeric and aromatic with no sand fillers or extenders added. It shall be capable of being spray applied to 50 mils nominal thickness in a single application. Minimum lining thickness shall be 40 mils. The polyurethane lining shall be ***a seamless*** flexible membrane that is corrosion, abrasion, and impact resistant; with a Shore "D" hardness of 60 to 65 at 78ºF (25.5ºC); a tensile strength of 2,878 psi and elongation of 52% per ASTM D-412; shall be resistant to abrasion as measured by a weight loss of no more than 42 mgs. per ASTM D-1044; and shall have a water vapor transmission rate (WVTR) of no more than 0.016 grams per 100 square inches (254 cm2) per 24 hours (75 mils DFT @ 73ºF (22.7ºC), 100% RH, per ASTM F-1249-90). Unless otherwise noted on the plans or in the specifications, all pipes shall be cement lined. Lining thickness per ANSI/AWWA C-104/A21.4 shall be 1/16 in. (min.) for 3 through 12 in. pipe, 3/32 in. for 14 in. through 24 in. pipe, and 1/8 in. for 30 through 54 in. pipe.

Joints shall be push-on rubber gasket types which meet the requirements of ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.

When flanged joints are required, they shall meet the requirements of ANSI/AWWA C115/A21.15, Flanged Ductile Iron and Gray Iron Pipe with Threaded Flanges. Mechanical flanged restrained joints may be used when approved by New Albany.

All flanged and mechanical joints for ductile iron pipe and fittings shall be made with stainless steel nuts, bolts, etc.

C. **Polyvinyl Chloride (PVC) Pipe and Fittings:** Unless shown otherwise on the Plans, in the Contract, or stipulated by New Albany, the Contractor may, at his option, use any of the following types of PVC pipe:

1. PVC pipe meeting the requirements of ASTM D 3034, Standard Specification for Type PSM Poly (Vinyl Chloride)(PVC) Sewer Pipe and Fittings. At a minimum, SDR 35 pipe shall be used.

2. PVC pipe meeting the requirements of ASTM F 679, Standard Specification for (Polyvinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings. At a minimum, SDR 35 shall be used.

3. PVC pipe meeting the requirements of ASTM F 789, Standard Specification for Type PS46 (Polyvinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings.

4. PVC pipe meeting the requirements of ASTM D 1785, Standard Specification for (Polyvinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120. Fittings shall meet the requirements of ASTM D 2466, Standard 4 Specification for (Polyvinyl Chloride) (PVC) Plastic Pipe Fittings.

Polyvinyl Chloride (PVC) Pipe shall be installed in accordance with these Specifications and ASTM Standards for "Underground Installation of Flexible Thermoplastic Sewer Pipe", D2321 requiring a minimum trench width of not less than the greater of either the pipe outside diameter plus 16 inches or the pipe outside diameter times 1.25 plus 12 inches.

Joints for PVC pipe meeting the requirements of ASTM D 3034, ASTM F 679, and ASTM F 789 shall be gasket, bell and spigot, push-on types which meet the requirements of ASTM D 3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals. Gaskets shall meet the requirements of ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

Fusible PVC pipe for gravity sewer service shall meet the requirements of ASTM D3034, ASTM F679, or ASTM D1785 for standard dimensions, as applicable. Fusible PVC pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe. Fusible PVC pipe lengths shall be assembled in the field with butt-fused joints. The fusion technician shall follow the pipe supplier’s guidelines for this procedure. The fusion technician shall have the current qualification credentials for the pipe size being fused, as documented by the pipe supplier. The fusible PVC pipe shall be installed in a manner so as not to exceed the recommended bending radius guidelines and the maximum safe pulling force established by the pipe supplier.

D. **Polyethylene Pipe and Fittings:** Polyethylene pipe shall meet the requirements of ASTM F 714, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter. The pipe shall be manufactured from material which meets the requirements of ASTM D 1248, Standard Specification for Polyethylene Plastics Molding and Extrusion Materials for Type III, Class C, Category 5, Grade P34 High Density Polyethylene (pipe designation PE 3608). Pipe made from these resins must have a long-term strength rating of 1,600 psi or more. Polyethylene pipe shall not be delivered to the site until New Albany has provided approval for the pipe class to be used.

Polyethylene pipe shall be installed in accordance with these Specifications and ASTM Standards for "Underground Installation of Flexible Thermoplastic Sewer Pipe", D2321.

Joints between plain end pipes and fittings shall be made by butt fusion using procedures that are in accordance with ASTM F2620 by a person who is a manufacturer's certified thermojointer.

E. **Polypropylene (PP) Pipe and Fittings:**

1. Polypropylene pipe shall be allowed on a case-by-case basis. IDEM and New Albany approval is required before installing polypropylene pipe.

2. Polypropylene pipe up to 30 inches in diameter shall meet the requirements of ASTM F2736 "Standard Specification for 6 inches to 30 inches Polypropylene Corrugated Single Wall Pipe and Double Wall Pipe." The pipe shall have a smooth interior with annular exterior corrugations and a minimum pipe stiffness of 46 psi when tested in accordance with ASTM D2412 "Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading." The polypropylene compound for pipe and fitting production shall be an impact modified copolymer meeting the material requirements of ASTM F2736, Section 4.

   Pipe shall be joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2736. Pipe shall be watertight according to the requirements of ASTM D3212 "Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals." Spigot shall have two gaskets meeting the requirements of ASTM F477 "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe" and the bell shall be reinforced with a polymer composite band installed by the manufacturer. Fittings shall conform to ASTM F2736. Bell and spigot connections shall utilize a spun-on, welded or integral bell and spigot with gaskets meeting ASTM F477.

   Service connections using polypropylene pipe up to 30 inches in diameter shall consist of a PVC hub, rubber sleeve and stainless steel band (INSERTA TEE or equal). Connection shall be a compression fit into the cored wall of a mainline pipe. Hub shall be made from heavy-duty PVC material. Stainless steel clamping assembly shall be made from minimum 301 grade steel. Rubber sleeve and gasket shall meet the requirements of ASTM F477. Gaskets shall be installed by the manufacturer. The water-based solution provided by the manufacturer shall be used during assembly.

3. Polypropylene pipe 30 inches to 60 inches in diameter shall meet the requirements of ASTM F2764 "Standard Specification for 30 to 60 in. Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure

Sanitary Sewer Applications." The pipe shall have smooth interior and exterior surfaces with annular inner corrugations. The pipe shall have a minimum pipe stiffness of 46 psi when tested in accordance with ASTM D2412 "Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading." The polypropylene compound for pipe and fitting production shall be an impact modified copolymer meeting the material requirements of ASTM F2764.

Pipe shall be joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2764. Pipe shall be watertight according to the requirements of ASTM D3212 "Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals." Spigot shall have two gaskets meeting the requirements of ASTM F477 "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe" and the bell shall be reinforced with a polymer composite band installed by the manufacturer. Fittings shall conform to ASTM F2764. Bell and spigot connections shall utilize a spun-on, welded or integral bell and spigot with gaskets meeting ASTM F477.

4. Installation of polypropylene pipe shall be in accordance with ASTM D2321 "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications" and manufacturer recommended installation guidelines.

12.11.3 Pipe Bedding and Encasement

Pipe bedding and encasement shall be of crushed stone or concrete and shall be installed as specified herein and as shown on the Plans, or as directed by New Albany. See Standard Drawings GC-01-01, GC-02-01, GC-03-01, and GC-04-01 in Appendix A for details regarding pipe bedding and encasement. Concrete used in encasements, caps, and cradles shall be Class B Concrete that has a minimum 28-day compressive strength of 2,500 psi, a minimum slump of 3 inches and a maximum slump of 5 inches. Crushed stone shall be coarse aggregate conforming to Size No. 57 as set forth in Section 805 of the KTC Standard Specifications and shall be free from sharp, angular pieces which could, in the judgement of New Albany, cause damage to the pipe.

A. **Crushed Stone Cradle**: Crushed stone cradle shall mean the placement of crushed stone from the subgrade level (6 inches below the outside of the pipe) up to the springline of the pipe. The crushed stone shall be deposited in the trench to grade, allowing for the thickness of the pipe wall. Bell holes shall be dug to relieve the bells of all concentrated loads and to provide uniform support throughout the pipe section. For larger pipes, the crushed stone shall be shoveled and shovel-sliced beneath the haunches of the pipe to assure uniform support. Unless shown otherwise on the Plans or directed by New Albany, the following types of pipes shall be supported on a crushed stone cradle.

1. Concrete Pipe

2. Ductile Iron Pipe

B. **Soil Bedding/Cradle:** For concrete pipe installed outside the roadway right-of-way with 9 feet of cover or less, the crushed stone cradle can be eliminated and replaced with job excavated native soil material. The earth trench bottom foundation should be scarified for the middle third of the pipe O.D. or at the Contractors option a minimum thickness of granular bedding can be provided. For rock foundations provide a standard 6-inch thick granular bedding.

C. **Crushed Stone Encasement**: Crushed stone encasement shall mean the placement of additional crushed stone above the crushed stone cradle to a level at least 6 inches above the outside top of the pipe and leveled off between the trench walls. The additional stone shall be placed in such manner to prevent damage to the pipe. Unless shown otherwise on the Plans or directed by New Albany, the following types of pipe shall be encased in crushed stone.

1. Polyvinyl Chloride Pipe

2. Polyethylene Pipe

3. Polypropylene Pipe

D. **Concrete Cradle**: Where a concrete cradle is required as additional support for a sanitary sewer pipe, or if a sanitary sewer pipe will have less than 2 feet of vertical clearance above an existing or proposed storm drain or utility conduit, a concrete cradle shall be installed. The length of the concrete cradle shall be as shown on the Plans or 2 feet beyond the outside edge of the underlying storm drain or utility conduit. The pipe shall be laid to line and grade, and shall be supported on concrete blocks, bricks or saddles set to prevent both vertical and lateral movement of the pipe. The use of wooden blocks will not be permitted. Concrete shall be placed around the pipe up to the springline of the pipe. Proper bracing shall be provided to prevent displacement or flotation of the sewer pipe during placing of concrete.

E. **Concrete Cap**: The length of the concrete cap shall either be as shown on the plans; or 2 feet beyond the outside edge of the storm drain or utility conduit; or 2 feet beyond the point where the sewer pipe attains 30 inches of cover in an easement; or 4 feet of cover in a right-of way or surfaces subject to vehicular traffic, or as directed by New Albany. The sewer pipe shall be laid and supported on a crushed stone cradle, and concrete shall be placed around the pipe and at least 6 inches above the top of the pipe for the full trench width. Proper bracing shall be provided to prevent displacement or flotation of the sewer pipe during placing of the concrete.

F. **Concrete Encasement**: Where shown on the Plans or where conditions exist requiring additional pipe protection (stream crossings, ditch crossings, shallow trench or poor soil conditions), pipes shall be encased in concrete, as determined by New Albany. The length of the concrete encasement shall be at least 2 feet beyond the point where additional pipe protection is required, as shown on the Plans, or as directed by New Albany. The sanitary sewer pipe shall be laid and supported as required for a concrete cradle, and concrete shall be placed around the pipe 6 inches either side of it and up to at least 6 inches over the top of the pipe. Proper bracing of the pipe shall be provided to prevent movement or flotation of the sewer pipe during placing of concrete. In rock-bottom streams, the encasement shall extend from 6 inches below the pipe up to the original rock level. Encasement shall be required when crossing a blue line stream and shall extend to 5 feet beyond the top of bank on each side of said stream. Concrete encasement is required for plastic pipe with less than 4 feet of cover in easements and less than 5 feet of cover in street rights-of-way. Unless otherwise directed by New Albany, a 4-inch PVC drain pipe shall be placed in the trench next to the carrier pipe and shall extend through the concrete encasement and 5 feet into the crushed stone encasement on both sides. The drain pipe shall be open on both ends. This will allow unimpeded flow of any groundwater in the sewer trench.

12.11.4 Backfill of Trench Excavations

Backfilling of trenches shall be accomplished as soon as possible after the pipe is placed. The Contractor shall have the option of using flushed and jetted or compacted backfill materials. The Contractor shall notify New Albany 24 hours in advance of all flushing and jetting and/or mechanical compaction options.

Sand for backfill placed in accordance with 12.11.4.A.1, herein referred to as Type 1-A backfilling, shall be comprised of sand or sand-gravel mixtures containing less than 30 percent passing a No. 40 sieve and less than 5 percent passing a No. 200 sieve. Sand or sand-gravel mixtures shall classify as SW, SP, or GW, and shall have a uniformity coefficient of 4.5 or more, as set forth in ASTM D2487, Standard Specification for Classification of Soils for Engineering Purposes.

Sand for backfill placed in accordance with 12.11.4.A.2, herein referred to as Type 1-B backfilling, shall have a coefficient of uniformity less than 4.5 but greater than or equal to 1.5.

Selected excavated material and borrow material shall be free from rubbish, organic matter, frozen soil, muck, and other perishable, compressible debris which prevents compaction of the material to a dense, uniform state. Borrow material shall not be comprised of soils represented by the following classifications, as determined in accordance with ASTM D 2487: MH, CH, OL, OH, or Pt. The maximum dry density of the borrow material shall meet or exceed 98 pounds per cubic foot in accordance with ASTM D 698, Standard Specification for Test Methods for Moisture-Density Relations for Soils and Soil-Aggregate Mixtures, Using a 5.5 lb. Rammer and a 12-in. Drop.

A. **Within Limits of Existing or Proposed Paved Surfaces:** At the Contractor's option, with prior approval by New Albany, backfill within the limits of existing or proposed paved surfaces shall consist of: Type I-A Backfill - sand, flushed and jetted, Type I-B Backfill - sand, combination flushed and jetted and mechanically compacted, or Type III Backfill - selected excavated material and/or approved borrow material - mechanically compacted. In special cases and with the approval of New Albany, the Contractor may utilize Type I-A sand backfill -flushed and jetted in the lower portion of the excavation and Type III backfill selected excavated materials - mechanically compacted in the upper portion of the excavation.

1. Sand - Flushed and Jetted (Type I-A). After the trench has been completely backfilled with sand, the backfill shall be densified by thoroughly flushing and jetting with water, beginning at the downstream end of the trench and proceeding upstream. Water to be used for flushing and jetting shall be supplied through hoses and pipes having a minimum diameter of 2 inches. The jet pipe shall have a minimum diameter of 1-1/2 inches. Jet pipes used to penetrate the backfill material shall be equipped with a shut-off valve and be of sufficient length to completely penetrate the sand backfill. The jet pipe shall be inserted into the sand backfill at a maximum spacing along the trench of 6 feet and the spacing shall be staggered along the trench area. The jet pipe shall penetrate the sand backfill to within 12 inches of the crushed stone encasement. Care shall be exercised to prevent the jet pipe from penetrating the crushed stone encasement. When the depth of the trench exceeds the length of the jet pipe the flushing and jetting shall be completed in lifts. The pipe shall remain in place until water is observed rising above the backfill throughout the full width of the trench and over a length of the trench equal to one-half the distance between adjacent jet installations. If this condition is not observed within a reasonable period, the Contractor shall increase the water flow or provide additional jet pipes. If the Contractor fails to flush and jet the sand backfill in accordance with the Specifications, the sand backfill shall be excavated and replaced with properly flushed and jetted sand backfill or material compacted in accordance with paragraph 3, at no additional cost to New Albany.

   The Contractor shall provide all piping, fittings, etc., necessary to deliver the water to the site and shall arrange with the water company, if applicable, for making the necessary taps and metering. All expenses incurred for installing the pipe and hose, together with the cost of the water, shall be borne by the Contractor. Following flushing and jetting and prior to pavement construction, the surface of the sand subgrade shall be thoroughly compacted following the procedures described in paragraph 2.

2. Sand, Combination Flushed and Jetted, and Mechanically Compacted (Type I-B). The trench shall be completely backfilled with sand, and the

backfill shall be densified by thoroughly flushing and jetting with water. Flushing and jetting procedures shall be in accordance with paragraph 1 above. Next, the sand backfill shall be removed to a depth of 3 feet below the pavement surface and stockpiled for later mechanical compaction. The exposed surface shall then be thoroughly compacted. The remainder of the trench shall be backfilled in two lifts of sand (approximately 12-inches thick) up to the pavement subgrade level with each lift being thoroughly compacted. For compaction, the Contractor shall supply a vibratory plate compactor or smooth drum vibratory roller capable of compacting sands to a minimum effective depth of 16-inches. The Contractor shall submit the manufacturer's equipment specifications for proof of this required effective compaction depth. The required number of passes of the roller or plate shall be established at the beginning of compaction operations for the Project by taking nuclear density tests to monitor the density increase with increased passes of the roller or plate. The required number of passes shall be set when no further increase in sand backfill density is measured.

3. Earth Materials - Compacted (Type III-A). Selected excavated materials or approved borrow materials containing no rock fragments with a maximum dimension larger than 4 inches shall be carefully deposited in uniform, horizontal layers, not exceeding 6 inches in compacted depth, in a zone located from the top of the cradle or encasement up to a horizontal plane located 2 feet above the exterior top of the pipe. Prior to compaction, each layer shall be level and evenly distributed on both sides of the pipe so as to not disturb, displace or damage the pipe. Each layer shall be thoroughly compacted to a minimum of 95 percent of the standard Proctor density, at moisture content between plus 2 percent and minus 4 percent of the optimum moisture content, as determined by ASTM D 698, utilizing mechanical compaction. Each layer shall be properly compacted before the next succeeding layer is placed. Any lift of fill which pumps under the weight of the compaction equipment shall be rejected, regardless of the field density test results.

   The remainder of the trench from the horizontal plane located 2 feet above the pipe up to the ground surface or top of the existing subgrade shall be backfilled with selected excavated materials containing no rock fragments with a maximum dimension larger than 4 inches, or approved borrow materials. The backfill shall be placed in uniform horizontal layers not exceeding 12 inches in compacted depth. Each layer shall be thoroughly compacted to a minimum of 95 percent of the standard Proctor density and a moisture content between plus 2 percent and minus 4 percent of the optimum moisture content, as determined by ASTM D 698, utilizing mechanical compaction methods. Each layer shall be properly compacted before the next succeeding layer is placed. Any lift of fill which pumps under the weight of the compaction equipment shall be rejected, regardless of the field density test results.

4. Combination Sand (Type I-A) and Earth Backfill (Type III-A). In trench situations where the lower trench dimensions limit the use of mechanical compaction equipment, the existing site conditions limit the effectiveness of the mechanical compaction methods, or where additional backfill material is required to replace unsuitable excavated materials, the Contractor may utilize flushed and jetted sand backfill in the lower portion of the trench and mechanically compacted earth material in the upper portion of the trench with prior approval of New Albany. The sand backfill operations shall extend from the top of the cradle or encasement up to a point where mechanical compaction can be properly accomplished in accordance with paragraph 1. The mechanical compaction operations shall extend from the top of the sand backfill up to the ground surface or top of the existing subgrade in accordance with paragraph 3.

5. No. 57 Crushed Stone - Compacted. With prior approval from New Albany, No. 57 crushed stone may be used as trench backfill within paved areas. The stone shall be carefully deposited in uniform, horizontal layers not exceeding 12 to 24 inches in compacted depth, depending on the type and size of compaction equipment used. The initial lift(s) of stone immediately above the pipe shall be level and evenly distributed on both sides of the pipe. Each layer shall be thoroughly compacted by making a minimum of two passes using a vibratory plate compactor or smooth drum vibratory roller capable of compacting clean stone to a minimum effective depth of the lift thickness selected. The Contractor shall submit the manufacturer’s equipment specifications for proof of this required effective compaction depth.

B. **Outside Limits of Existing or Proposed Paved Surfaces**. At the Contractor's option, trench backfill outside the limits of existing or proposed paved surfaces shall consist of earth materials (selected excavated or approved borrow materials) which are flushed and jetted or compacted. The upper one foot of the earth backfill shall be essentially free from rock, gravel or other hard, durable fragments.

1. Earth Materials - Flushed and Jetted (Type II Backfill). The lower portion of the trench backfill extending from the top of the cradle or encasement to a horizontal plane located 2 feet above the exterior top of the pipe shall contain no rock or rock fragments with a maximum dimension larger than 1 inch. The remainder of the trench shall be backfilled with selected excavated materials or approved borrow materials containing no rock fragments larger than 1 cubic foot. After the trench has been completely backfilled with selected excavated material or approved borrow material, the backfill shall be densified by thoroughly flushing and jetting with water, beginning at the downstream end of the trench and proceeding upstream. The backfill shall be thoroughly and uniformly sluiced and flooded by introducing water at the top of the trench and by inserting the jet pipe into the

backfill at intervals as specified above along the trench. This process shall be continued until the backfill is completely saturated and no further settlement is observed. Hoses, jet pipes and the maximum depth of insertion shall be as specified above. After the backfill in the trench has substantially dried and completed any additional settlement, any settlement below the finish grade shall be refilled with additional earth, and compacted in accordance with paragraph 2 below.

2. Mechanical Compaction of Earth Materials (Type III-B). Selected excavated materials or approved borrow materials, containing no rock or rock fragments with a maximum dimension larger than 3 inches, shall be carefully deposited in uniform, horizontal layers, not exceeding 6 inches in compacted depth, in a zone located from the top of the cradle or encasement up to a horizontal plane located 2 feet above the exterior top of the pipe. Prior to compaction, each layer shall be leveled and evenly distributed on both sides of the pipe so as not to disturb, displace or damage the pipe. Each layer shall be thoroughly compacted to a minimum of 85 percent of the Standard Proctor density before the next succeeding layer is placed. Any lift of fill which pumps under the weight of the compaction equipment shall be rejected, regardless of the field density test results. The remainder of the trench from the horizontal plane located 2 feet above the top of the pipe up to the ground surface shall be backfilled with selected excavated materials or approved borrow material containing no rock fragments larger than 1 cubic foot. The material shall be placed in uniform horizontal layers not exceeding 12 inches in compacted depth. Each layer shall be compacted with a dozer or other heavy, earth-moving equipment traveling back and forth over the material until no further settlement is observed.

12.11.5 Leakage Testing for Sanitary Sewers

Testing shall not be scheduled until at least 24 hours after verbal contact is made with the project inspector. The Contractor shall perform leakage tests on sanitary sewer pipes to ensure that installed pipes are not subject to excessive infiltration or exfiltration. Sanitary sewer pipes installed in areas where other underground facilities will be constructed subsequent to the sanitary sewer shall be tested twice; at the completion of the sanitary sewer installation, and following the installation of the other underground facilities. All leakage testing must be performed in the presence of a representative of New Albany. No leakage testing shall be performed prior to jetting.

When conducting any leakage test, the Contractor shall provide all meters, weirs, gages, water, equipment and personnel necessary to perform the test as specified. New Albany shall provide the inspection personnel, stopwatch, recording forms and calculations to demonstrate if the test passed or failed.

If a pipe installation fails to pass the requirements as specified herein, the Contractor shall repair or replace all defective materials or Workmanship, and conduct additional leakage tests necessary to demonstrate that the repaired section meets the leakage requirements, at no additional cost to New Albany. If requested by New Albany the Contractor shall submit in writing a method of repair, and must be approved by New Albany before repair can begin.

A. **Low-Pressure Air Tests:** When conducting a low-pressure air test, the Contractor shall securely install and brace all plugs prior to pressurizing the pipe. Personnel shall not be allowed to enter manholes when the sewer pipe is pressurized. Low-pressure air tests shall be conducted in accordance with the following:

   1. Reinforced Concrete Pipe - ASTM C 924, Recommended Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Test Method.

   2. Polyvinyl Chloride Pipe (PVC), - UNI-B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe. The "half-time" testing method will be accepted for these pipes only if the section of pipe being tested has a zero drop in pressure for half the test time specified for the pipe's length to diameter ratio.

   3. Polyethylene Pipe (HDPE), Polypropylene pipe (PP) - ASTM F1417 “Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air”

B. **Infiltration/Exfiltration Tests for Concrete Pipe:** Reinforced concrete pipe may be tested for direct infiltration or exfiltration in lieu of performing low-pressure air tests. Tests shall be performed in accordance with ASTM C 969, Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Lines, except that the allowable rate of infiltration or exfiltration shall be 150 gallons per 24 hours per inch diameter per mile of pipe. Regardless of the leakage test results, any spurting or gushing streams of water entering the sewer or manhole shall be sealed at no additional cost to New Albany.

C. **Deflection Tests for Sanitary Sewers:** The Contractor shall test all thermoplastic main line pipe by use of a calibrated mandrel, or other device approved by New Albany, to ensure that no pipe deflection has occurred greater than 5 percent of the inside diameter of the pipe. Pipe shall be fully backfilled and compacted at least 30 days prior to testing. The Contractor shall test the entire length of the sewer installed. Any pipe section exhibiting greater than 5 percent deflection shall be replaced and retested, at no additional cost to New Albany. Should the test fail, New Albany will require a second deflection test 30 days after the pipe is modified, backfilled and compacted at the Contractor’s expense.

   Deflection testing shall be performed at the time of the first or final air test. If conditions warrant, the inspector may request additional tests to be performed after final restoration.

NOTE: When failure of the second air test requires repair of the main line sewer, an additional deflection test shall be required.

12.11.6 Loading Calculations

All sewers shall be designed to prevent damage from superimposed loads during and after construction. Proper allowance for loads on sewers shall be made, based on trench width and depth. When standard strength sewer pipe is not sufficient, extra strength pipe or special construction methods shall be specified. Live and dead loads shall be determined for all sewers and calculations submitted to New Albany for review. Dead load, live load and impact loading requirements must be met in the selection of pipe materials and installation methods.

12.12 MANHOLES

12.12.1 Manhole Locations

Manholes shall be required at the following locations:

A. Changes in sewer grades or alignment.

B. Sewer junctions.

C. Where required, not to exceed the maximum manhole spacing.

D. Changes in sewer diameters.

E. The location of the terminal manhole in each sewer line should be based on many factors including manhole spacing, driveway locations, the position of improvements on the lots being served, and the location of temporary sanitary facilities, such as septic tanks. A definitive single policy cannot be established for all circumstances, although the sewer line would normally terminate in the vicinity of the downstream property line.

F. Where vertical stacks connect to large (>48 inches) sewers an additional manhole or cleanout (if connecting sewer is 6 inches) shall be required approximately 5 feet from the stack.

12.12.2 Maximum Manhole Spacing

Size of Sewer	Distance
8" to 15" diameter	400'
18" to 30" diameter	500'
Over 30” diameter	600'

When certain conditions warrant, such as the elimination of a manhole, the manhole spacing can be exceeded with the approval of New Albany and IDEM.

12.12.3 Diameter

For new construction, the minimum diameter of manholes shall be 60 inches, although larger diameters are necessary in special instances, such as acute angle considerations with pipe diameters greater than 24 inches. The minimum elevation drop across new manholes and larger diameter manholes shall be 0.1 feet for changes in pipe direction greater than 45 degrees. All manholes must be checked to ensure that sufficient wall is supplied between pipe openings to meet all precast manhole criteria. See Appendix B.

Replacement manholes for existing sewers shall have a minimum diameter of 60". For sewers of sufficient depth, a 60" diameter (minimum) base section may be installed to a distance of 84" (minimum) above the pipe invert with a cone section above the base which transitions to a 48" diameter (minimum) riser. The intention of this requirement is to provide space for relining equipment and personnel in order to reline the existing sewer mains as necessary.

12.12.4 Watertight

Watertight manholes and covers are to be used where the manhole is located within the 100 year floodplain.

12.12.5 Drop Inlets

A vertical or slanting drop inlet shall be provided for a sewer entering a manhole at an elevation higher than the sewer leaving the manhole. A drop inlet will not be allowed for elevation differences less than 2 feet.

12.12.6 Manhole Collars

A 6-inch collar shall be used when it is certain the manhole rim will not be lowered in the future and a 12-inch or greater collar when lowering is anticipated.

12.12.7 Manhole Numbering

All newly constructed public or private manholes will be assigned identification numbers. The manhole number shall start with the Basin number followed by the next available sequential number. For example, manholes in Basin 16 shall be named 16-1, 16-2, etc. Contact the Sewer Department at Ph. 948-5320 for applicable Basin number and the next available manhole number. The assigned number for the respective manhole will be shown on both the plan and profile sheets as part of the structure note. During construction it is the responsibility of the contractor to stamp the number into the structure rim.

12.12.8 Chimney Seals

Internal, mechanical chimney seals are required on all new New Albany sanitary manholes. Chemical chimney seals are to be used only for rehabilitation and then only in non-paved areas. Chimney seals are not required for New Albany storm manholes.

12.12.9 Manhole Barrel Joints

Joint sealant materials shall be of the sizes recommended by the manufacturer to provide watertight seals between precast manhole sections. When requested, the Contractor shall furnish information showing that the sizes of the joint sealants being supplied meet the manufacturer's recommendations. Joints between precast sections shall be sealed in a two-way fashion consisting of a Type B sealant and an exterior joint wrap. The Type B sealant consists of a preformed flexible butyl rubber sealant in conformance with ASTM C990-06 - Joints for Concrete Pipe Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealant. The exterior joint wrap shall consist of a six-inch wide strip of polyolefin covered with butyl mastic joint sealant, or a hydrophilic sealant having a 50% expansion factor and being capable of withstanding 25 PSI of pressure. The exterior joint wrap shall be in accordance with ASTM C877-08 Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections. Exterior joint wraps are not required for New Albany storm manholes.

12.12.10 Manhole Frame and Collar Connections

All standard manhole frames shall be bolted to the collar with two 1-inch diameter anchor bolts positioned 180 degrees apart and all watertight manhole frames shall be bolted to the collar with four 1-inch diameter anchor bolts positioned 90 degrees apart.

12.12.11 Manhole Personnel and Equipment Access

Personnel access is required at manholes sufficient for New Albany maintenance crews to enter the area. A waiver is required in the event access cannot be provided.

12.12.12 Manhole Testing

All new sanitary manholes shall be subject to vacuum testing in accordance with ASTM C1244. Vacuum testing shall be conducted in the presence of the New Albany inspector after chimney seal installation. Manholes that do not pass the vacuum test shall be repaired and retested at no cost to New Albany.

12.13 STUBS

Generally, stubs shall be provided in cul-de-sacs, at points of possible future extension, and at the terminus of the sewer line, unless otherwise directed by New Albany. Stubs shall be one foot long measured from outside of manhole barrel for PVC, DI, PP, or PE pipe or one pipe length for concrete pipe. The allowable length for cul-de-sac stubs is 20 feet without specific approval from New Albany.

12.14 PROPERTY SERVICE CONNECTIONS

A. The property service connection (PSC) is the section of pipe between the R/W or easement line and the mainline sewer. Standard symbols and general notes pertaining to the size, type and length of "Y" or "T" branches and property service connections are shown on Exhibit 4-3 and shall be used on the plans. The standard connection for single-family residences will be 6 inches; commercial or industrial connections shall be individually considered with the minimum size being 6 inches. Green metallic “locater” tape labeled “SEWER” must be installed above the PSC at a depth of not more than 30 inches. The location of the PSC shall be approved by the New Albany inspector. See the standard detail SP-01-01 Property Service Connection.

B. A minimum slope of 1.00% (1/8”/ft.) for property service connections shall be used for determining design elevations. However, in all cases, the invert elevation of the property service connection at the easement or property line shall be equal to or higher than the crown of the sewer. The depth of the property service connection at the R/W line will conform to Exhibit 12-6 and shall be at least 3’ deep.

C. The minimum slope for the house connection (service line from the property line to the house) will be 1.0% (1/8”/ft.). The house connection line shall be laid at a uniform grade and in as straight alignment as possible. The house connection line shall not be laid parallel to or within three feet of any bearing wall.

D. Stacks shall be used when they are more economical than the typical property service connection. Stacks shall also be used in areas where the depths of the mainline sewer, existing utilities, or other obstructions are located at elevations that prevent the use of the typical property service connections. As a rule of thumb, two guidelines must be satisfied for a stack to be used. The receiving sewer must have a minimum cover of 12 feet and the length of stack (measured vertically) must be at least 3 feet. An additional requirement is to provide the minimum 3 feet of fall between the top of stack and house discharge point as indicated on Exhibit 12-6. Example (assume level ground) - if a receiving sewer has 12 feet of cover and the discharge point at the house is 7 feet below ground, a stack would not be used; however, if the discharge depth was 6 feet or less, a stack would be required. Obviously field conditions may dictate deviations. See standard details SS-01-01 Stack Connection to 30” or Smaller Pipe and SS-02-01 Stack Connection to 30” or Larger Pipe.

E. For property services that connect to deep sewer (deeper than 10 feet) and for near vertical (within 30 degrees of vertical) lateral risers, install a vertical riser adapter with flange (Plastic Treads Model No. G-986 or equal) between the bottom fitting and the vertical riser section to prevent settlement of the lateral riser and to prevent possible damage to the bottom fitting joint.

F. Each PSC must have a Two-Way Cleanout installed just inside the R/W or easement line. A one-way cleanout shall also be installed within ten feet of the exterior wall and shall be installed to open in the direction of the flow. If a grease interceptor is installed outside the building, then a cleanout shall be installed in both sewer lines that exit the building. Cleanout locations shall be approved by the New Albany inspector. Cleanouts shall be a minimum of 6 inches. See standard details SC-01-02 One Way Cleanout and SC-02-02 Two Way Cleanout.

G. Property service connections that are 6 inches in diameter may be jacked without a casing.

H. Jointless pipe shall be used for new or rehabilitated PSCs. VCP shall not be used for new or rehabilitated PSCs.

12.15 FLOATATION

All sewers and sewer structures to be constructed where high groundwater conditions exist or where flooding of the trench is anticipated shall be designed to prevent floatation or excessive pipe flexing.

12.16 ANCHORS

When sewer slopes of 20 percent or greater are encountered, the sewer shall be securely anchored by using concrete anchors or other specially designed anchoring devices to prevent slippage. The design and method used shall be approved by New Albany.

Sewer slopes greater than 40 percent require approval by New Albany.

12.17 CONCRETE ENCASEMENTS

Concrete encasement shall extend a minimum length of 2 feet beyond the point where a 4-foot depth of cover is reached or to a point 5 feet beyond the tops of banks when crossing a ditch or stream. Concrete encasements shall be used when it is necessary to prevent floatation, when crossing streams, ditches or existing storm drains. They shall also be used where soil conditions may indicate the possibility of heavy erosion, where crossing over utilities with less than 2-feet of clearance, or in areas where the sewer has less than the required cover. The minimum length of the concrete encasement shall be 2 feet beyond the outside diameter of the storm drain or utility conduit.

12.18 TRENCHLESS PIPE INSTALLATION - DESIGN AND CONSTRUCTION REQUIREMENTS

When open cutting is not permitted, the design plans will identify an appropriate pipe installation method and required information for the contractor to bid the project. The engineer will design the trenchless pipe installation using one of the following methods:

- Tunneling
- Boring and Jacking
- Horizontal Directional Drilling
- Pipe Bursting

The contractor will have the option to offer a different method of trenchless pipe installation than the one proposed on the plans, subject to approval and acceptance by New Albany. When an alternate method is proposed by the contractor he will be responsible for the final design calculations. A plan of operation and list of proposed materials will be submitted for New Albany approval. Structural calculations will be required for all components. Items include: casing and carrier pipe, tunnel liner plates, the working pits, sheeting and shoring, electrical facilities, ventilation, and communications. All design calculations and plans must be signed and sealed and submitted by a professional engineer licensed in the State of Indiana. The contractor will also need to coordinate their excavations beforehand with Indiana 811- Call Before you Dig.

The following criteria shall be followed whenever a trenchless pipe installation is used. Any deviation from this criterion will require prior approval from New Albany.

A. **Tunneling**

1. Tunnels shall be constructed using steel liner plates.

2. The tunnel liner shall have a minimum outside diameter of 48 inches.

3. The carrier pipe shall be installed at least 4 inches above the invert of the liner, and there shall be a minimum distance of 8 inches between the top of the carrier pipe and the top of the tunnel liner.

4. Tunnel liner plates and joints shall be of leak proof construction, capable of withstanding E80 loading for railroads and H25 loading for roadways.

5. Liner plates shall have minimum yield strength of 28,000 psi.

6. It will not be necessary to use a protective coating or cathodic protection on tunnel liners, casing or sewer pipes.

7. The space between tunnel liner plates and carrier pipe shall be filled with grout or with pneumatic backstowed pea gravel or No. 9 crushed stone.

B. **Boring/Jacking**

1. In boring excavation, the carrier pipe shall be encased in a steel casing pipe of sufficient size to provide clearance for the proper installation of the sewer pipe. The minimum inside diameter of the casing pipe shall be as follows:

Carrier Pipe Nominal Diameter (Inches)															
4	6	8	10	12	14	15	16	18	20	21	24	27	30	33	36
Casing Pipe Nominal Diameter (Inches)															
10	12	16	18	20	24	24	30	30	30	36	36	42	48	50	50

2. All casing pipe must have a minimum thickness of 3/8-inch unless otherwise determined by designer.

3. Steel casing pipe shall have minimum yield strength of 35,000 psi.

4. Casing spacers shall be used to centrally position the carrier pipe inside the casing pipe. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe within the casing pipe, within two (2) feet of each side of a pipe joint, and the rest evenly spaced. Casing spacers shall be bolt-on style with a shell made in two (2) sections of heavy T-304 stainless steel or solid polyethylene (to be used with PVC pipe only).

5. If spacers are not used then the entire void between the carrier pipe and the casing pipe shall be filled with grout or with pneumatic backstowed pea gravel or No. 9 crushed stone. Any void space outside the casing pipe shall be pressure-filled with cement grout. Cement grout for filling the voids between the carrier and casing pipe shall be a mixture suitable for grouting and shall be approved by New Albany prior to its use.

6. At each end of the casing pipe, the carrier pipe shall be sealed with casing end seals or grout. The seal shall extend a minimum of 12 inches in each direction from the end of the casing pipe. The wrap-around end seals shall be made of a waterproof flexible coal tar membrane reinforced with fiberglass, or synthetic rubber in which the two exposed edges shall be adhesively bonded forming a watertight seal. The ends of the wrap shall be sealed on the casing and carrier pipe by stainless steel bands.

C. **Horizontal Directional Drilling**

1. Horizontal Drilling is used to install 2 inch to 30 inch diameter pipes in segments up to 1,000 feet.

2. Completed in three phases: boring of pilot hole, enlarging of hole by reaming, and pulling of pipe through enlarged hole.

D. **Pipe Bursting**

1. Pipe Bursting is used to replace existing lines that have defects that cannot be rehabilitated by normal rehabilitation methods.

2. A static, hydraulic, or pneumatic pipe bursting tool with an expander is launched through the old pipe, fragmenting it and compacting the old pipe fragment into the surrounding soil, creating a path for the new pipe.

12.19 RAILROAD CROSSINGS

12.19.1 Criteria

The following criteria shall be strictly adhered to when the planning for sewer construction affects railroad rights-of-way and facilities (railroad companies may specify more stringent requirements):

A. Sewers shall cross tracks at an angle as close to 90 degrees as practical, but preferably never less than 45 degrees. Sewers shall not be placed under railroad bridges where there is a likelihood of restricting the required waterway area of the bridge or where there is a possibility of endangering the foundations.

B. Sewer lines crossing under railroad tracks and rights-of-way shall be constructed using one of the trenchless methods outlined above and as permitted by the railroad company.

C. Sewers under railroad tracks and across railroad rights-of-way shall extend to a point, a minimum distance of 25 feet from the centerline of the outside track or the right-of-way line, whichever occurs first.

D. Sewer lines laid longitudinally along railroad rights-of-way shall be located as far as practical from any tracks or other important structures. If located within 25 feet of the centerline of any track or should there be danger of damage from leakage to any bridge, building, or other important structure, the sewer shall be encased or shall be of a special design as approved by New Albany and the affected railroad.

E. When placed along railroad rights-of-way, the top of the pipe shall have a minimum cover of 4 feet.

F. Trenchless sewer installations under railroad tracks and across railroad rights-of-way shall be no less than 4 feet deep measured from the bottom of the rail to the top of the sewer installation at its nearest point. The top of the installation shall not be above the invert of existing or proposed ditches.

12.19.2 Railroad Conflict Drawings

Railroad conflict drawings shall conform to the following criteria:

A. Railroad conflict drawings, as shown in Exhibit 12-7, shall be prepared on 8.5" x 11" sheets. The plan and profile may be placed on one or more sheets as dictated by the scale. The record number of the plan and/or profile sheet that shows the conflict shall be added to the conflict drawing.

B. Drawings shall be prepared to scale showing the relationship between the proposed sewer and the railroad, angle of crossing, location of utilities, original survey station of the railroad (when available), right-of-way lines, topography, and general layout. The profile established from a field survey shall show the sewer in relation to the actual ground and tracks. The limits of installation by station, sewer line soundings and borings, and all other pertinent information shall be shown on the drawing.

C. Railroad conflict drawings shall be submitted along with a complete questionnaire, which shall be furnished by the railroad company.

12.20 HIGHWAY CROSSING

Sewer pipe installations constructed under State, County, or City maintained roadways, will need to conform to the design requirements of the respective governing agency. One of the designer's first tasks will be to determine if open cutting will be allowed.

Construction shall meet the following requirements (more stringent criteria may be required on a project specific basis):

A. Sewers shall cross the roadways at an angle as close to 90 degrees as practical, but preferably never less than 45 degrees. Sewers shall not be placed under roadway bridges where there is a likelihood of restricting the required area of the bridge or where there is a possibility of endangering the foundations.

B. Sewer lines crossing under highways and rights-of-way shall be constructed using one of the trenchless methods outlined above and as permitted by the governing agency.

C. Sewer installations under roadways shall have a minimum depth of 3 feet from the surface elevation to the top of the installation. The top of the installation shall not be above the invert of existing or proposed ditches.

D. Sewer installations under roadways shall extend a minimum of 10 feet outside the existing paving, as measured at right angles to the roadway, or to the toe of the slope when the roadway is on fill and the toe of slope exceeds 10 feet outside the existing paving. Installations should likewise extend to the top of slope furthest from the roadway on ditches if the top of slope is greater than 10 feet from the edge of pavement.

E. Sewer lines laid in a longitudinal direction on highway rights-of-way shall be located a sufficient distance from the edge of the pavement to allow adequate working room and to provide maximum safety to the motorist when the roadway is to remain open to traffic. Those sewer lines within the roadway right-of-way, but not located under paved areas, shall have no less than 5 feet of cover.

F. Metallic tape shall be laid in the trench above the pipe from the edge of pavement to the right-of-way line or from the end of the tunnel to the right-of-way line on all crossings of State highways.

12.21 CREEK, STREAM OR DITCH CROSSINGS

Sanitary sewer pipes for crossing a creek, stream or ditch shall be a jointless pipe and shall be encased in concrete as required in Section 12.17 Concrete Encasements and Section 12.11.3, paragraph F. Concrete Encasement.

EXHIBIT 12-1
COMPUTATIONS FOR
SANITARY SEWER DESIGN

EFFECTIVE DATE: DECEMBER 2012

COMPUTATIONS FOR SANITARY SEWER DESIGN

ENGINEER ______________________

Project Name ______________________

Project No. ______________________

Sheet__of ________
Computed By ________
Checked By ________
Date ________

1	2	3		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
Location																			Invert Elevation of Sewer		
Drain. Area Designation	Sewer Line Designation	Manhole		Average Daily Flow	Peak Factor	Total Sewage Flow (Peak Flow)		Design Flow "Q" (Peak Flow)	Length	Slope	Size	"Q" Full	"V" Full	Design "Q" / "Q" Full	Design Flow Depth Ratio	Design "V" / "V" Full	Design "V"	Drop	Upper End	Lower End	Remarks
		From	To																		
		Sta.	Sta.	GPD		GPD	MGD	c.f.s	LF	ft/ft	in.	c.f.s	f.p.s	Ratio	d/D	Ratio	f.p.s				

Col. 1	Drainage Area Designation
Col. 2	Sewer Line Designation
Col. 3	Manhole Designation by Station
Col. 4	Average Daily Flow (Gallons per day)
Col. 5	Peak Factor
Col. 6	Total Sewage Flow in gallons per day (Col. 4 x Col. 5)
Col. 7	Total Sewage Flow in Million gallons per day (Col. 6 divided by 1,000,000)
Col. 8	Design Flow (Col. 7 x 1.5472 cfs/MGD)
Col. 9	Length of Pipe measured from centerline of Manhole to centerline of Manhole
Col. 10	Design Slope
Col. 11	Pipe Size
Col. 12	"Q" Full
Col. 13	"V" Full
Col. 14	Design "Q" to "Q" Full ratio (Col. 8 divided by Col. 12)
Col. 15	Ratio of pipe diameter (D) to Design Flow Depth (d) in feet (Exhibit 12-4)
Col. 16	Design "V" Full to "V" Full Ratio (Exhibit 12-4)
Col. 17	Design Velocity (Col. 13 x Col. 16)
Col. 18	Difference in Invert Elevations

Zoning District	Description	Min Lot Size per Dwelling Unit[1] ft^2 (acre)	Dwelling Units per Acre	Population Per Unit	Population Per Acre	Average Gal/ Cap/Day	Average Gal/ Acre/Day
AR	Agricultural Residential	18,000 (.41)	2	4	8	100	800
R1	Suburban Residential	12,000 (.275)	3.6	4	14.5	100	1,450
R2	Urban Residential	7,200 (.165)	6.1	4	24.4	100	2,440
R3	Single-Family (Med Density)	6,000 (.14)	7.1	4	28.4	100	2,840
R3	Multi-Family (Med Density)	3,600 (.08)	12.5	4	50	100	5,000
R4	Single-Family (High Density)	6,000 (.14)	7.1	4	28.4	100	2,840
R4	Multi-Family (High Density)	1,800 (.04)	25	3	75	100	7,500
R5	Multi-Family (High Rise)	900 (.02)	50	3	150	100	15,000
RN-1	Neighborhood Residential Single-Family	4,800 (.11)	9.1	4	36.4	100	3,640
RN-1	Neighborhood Residential Multi-Family	3,000 (.07)	14.3	3	42.9	100	4,290
RN-2	Neighborhood Residential-2 Single-Family	3,600 (.08)	12.5	4	50	100	5,000
RN-2	Neighborhood Residential-2 Multi-Family	2,400 (.06)	16.67	3	50	100	5,000

Zoning District	Equivalent Population/ Acre	Average Gal/Cap/Day	Average Gal/Acre/Day
Commercial	20	100	2,000
Industrial[2]	10	100	1,000
Non-Developable Land	1	100	100

1. Minimum lot sizes per dwelling unit are from Tables IIa and IIb in the New Albany Code of Ordinances, Chapter 156 Zoning Code
2. This figure may be adjusted by New Albany if a major industrial user is anticipated

EXHIBIT 12-3
MINIMUM ALLOWABLE SLOPES

EFFECTIVE DATE: DECEMBER 2012

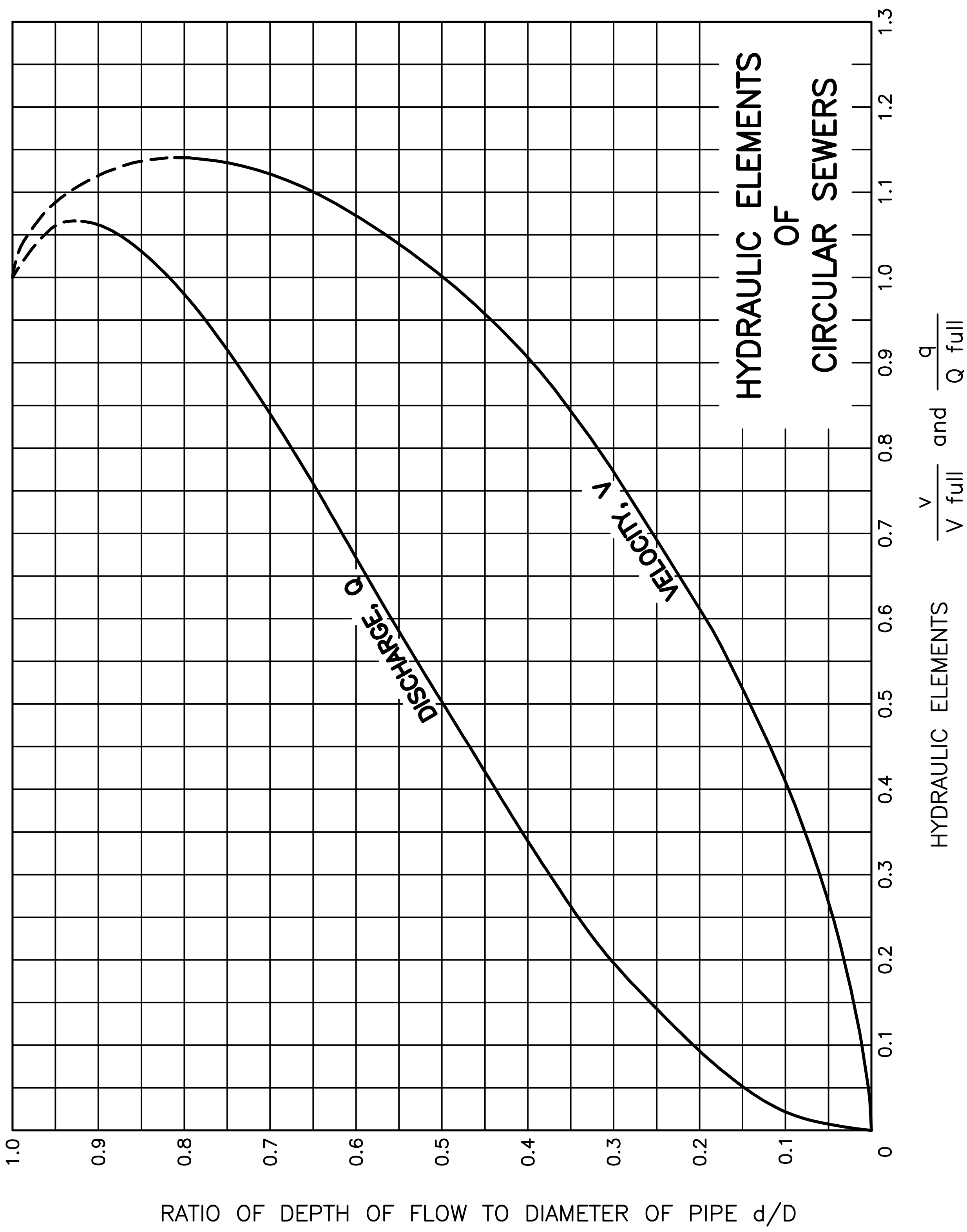
Manning's "n" = 0.013

PIPE DIA. (inches)	SLOPE (ft/ft)	VELOCITY FULL (ft/sec)
8	0.0040*	2.2
10	0.0028	2.1
12	0.0022	2.1
15	0.0015	2.0
18	0.0012	2.0
21	0.0010	2.1
24	0.0008	2.0
27	0.00067	2.0
30	0.00058	2.0
36	0.00046	2.0
42	0.00037	2.0
48	0.00030	2.0
54	0.00026	2.0
60	0.00026	2.0
66	0.00026	2.3
72	0.00026	2.4
78	0.00026	2.6
84	0.00026	2.7
96	0.00026	3.0
108	0.00026	3.2
120	0.00026	3.4
132	0.00026	3.6
144	0.00026	3.8

*If 2.0 fps can not be achieved with the design flow,
the minimum slope will be 0.0070. ft/ft

EXHIBIT 12-4
HYDRAULIC ELEMENTS OF
CIRCULAR SEWERS

EFFECTIVE DATE: DECEMBER 2012



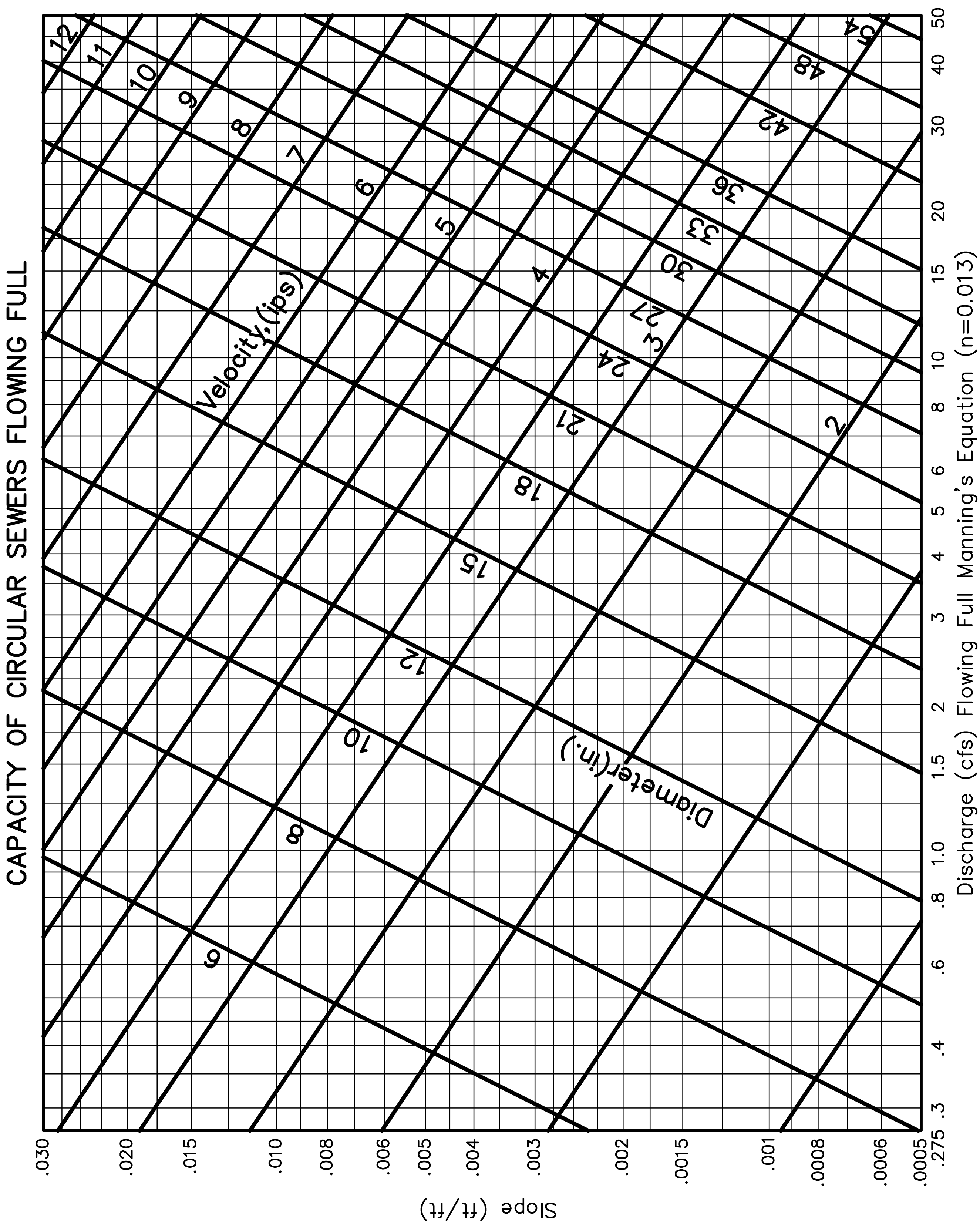

CAPACITY OF CIRCULAR SEWERS FLOWING FULL
Discharge (cfs) Flowing Full Manning's Equation (n=0.013)
.275 .3 .4 .6 .8 1.0 1.5 2 3 4 5 6 8 10 15 20 30 40 50
Slope (ft/ft)
.030 .020 .015 .010 .008 .006 .005 .004 .003 .002 .0015 .001 .0008 .0006 .0005
Velocity (ips)
12
11
10
9
8
7
6
5
4
3
2
Diameter (in.)
6
8
10
12
15
18
21
24
27
30
33
36
42
48
54

EXHIBIT 12-5 PAGE 2

PIPE FLOW CHART FULL (21"-144")

EFFECTIVE DATE: DECEMBER 2012

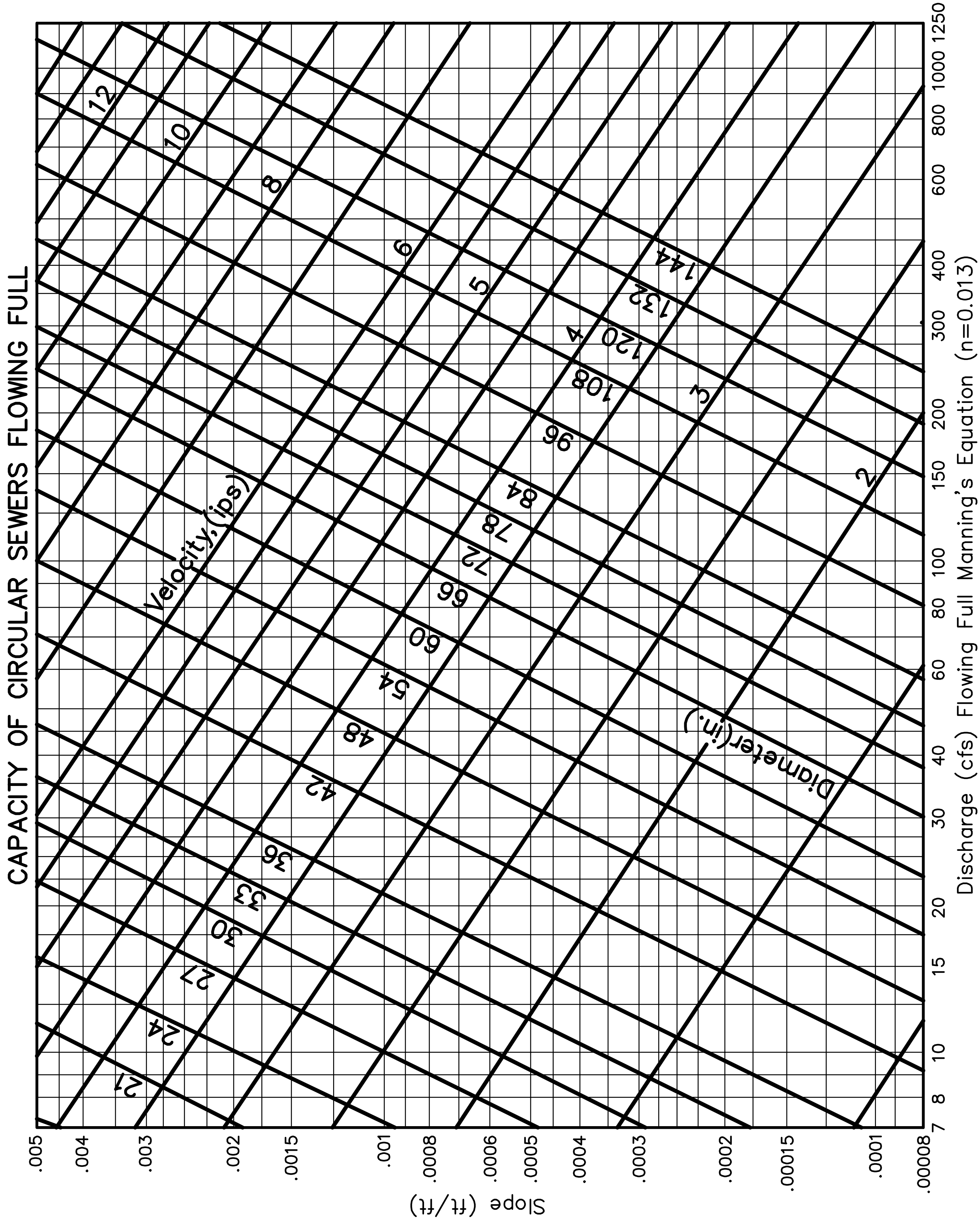
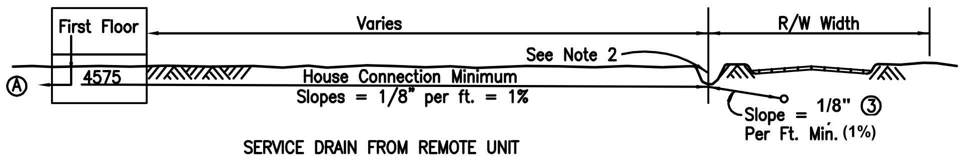
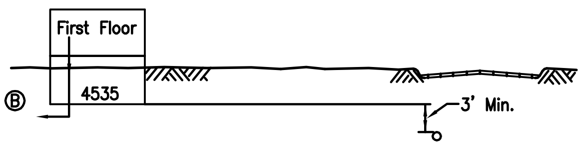


EXHIBIT 12-6
TYPICAL SERVICE CONNECTIONS

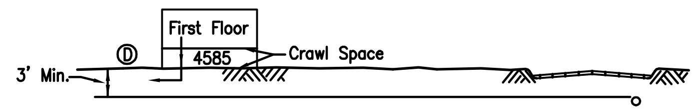
EFFECTIVE DATE: DECEMBER 2012



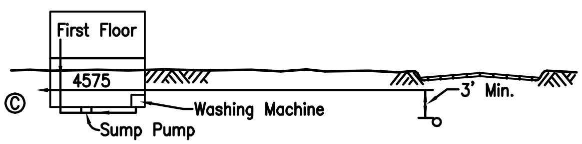
SERVICE DRAIN FROM REMOTE UNIT
When houses or other units are remotely located, consideration must be given to the amount of drop from the point of service to the sewer. The following slopes are considered minimum when not controlled by terrain, low areas, etc.



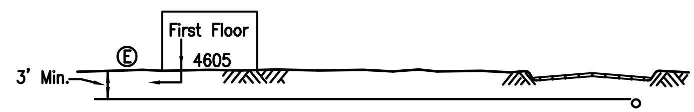
HOUSE DRAIN THROUGH BASEMENT FLOOR
When this condition controls the upper end of a sewer and no sanitary or laundry facilities exist in the basement, consideration should be given to a control depth less than 3' below the basement floor elevation.



HOUSE DRAIN THROUGH FIRST FLOOR WITH CRAWL SPACE
The crown of the sewer shall be a minimum of 3' below the ground at the point of service outlet.



HOUSE DRAIN THROUGH BASEMENT WALL
Service elevation outlets for sump pumps which do not discharge shower, laundry or sanitary facilities shall not control the sewer depth.



HOUSE DRAIN THROUGH FIRST FLOOR WITH SLAB TYPE FOUNDATION
The crown of sewer shall be a minimum of 3' below the first floor elevation

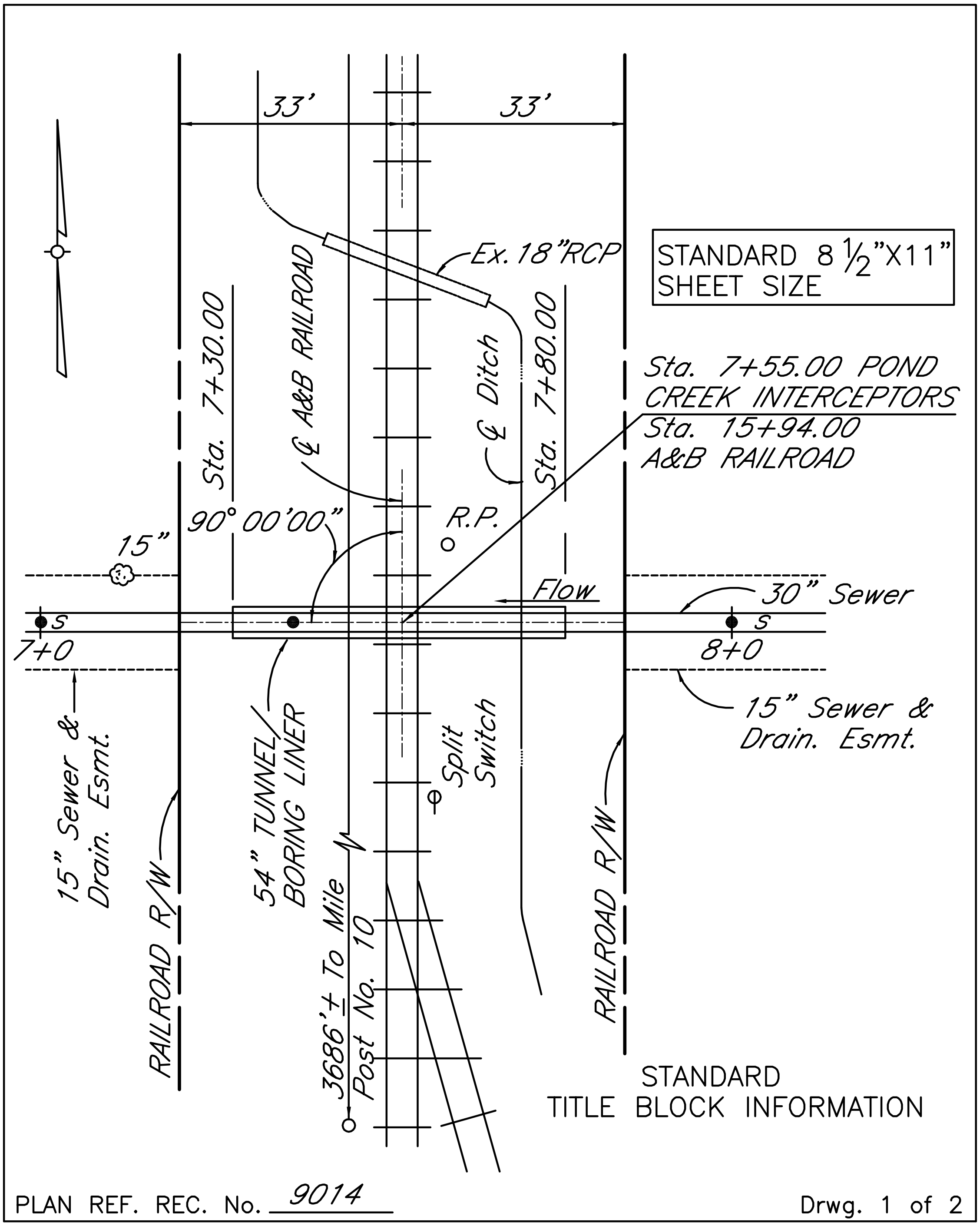
LEGEND

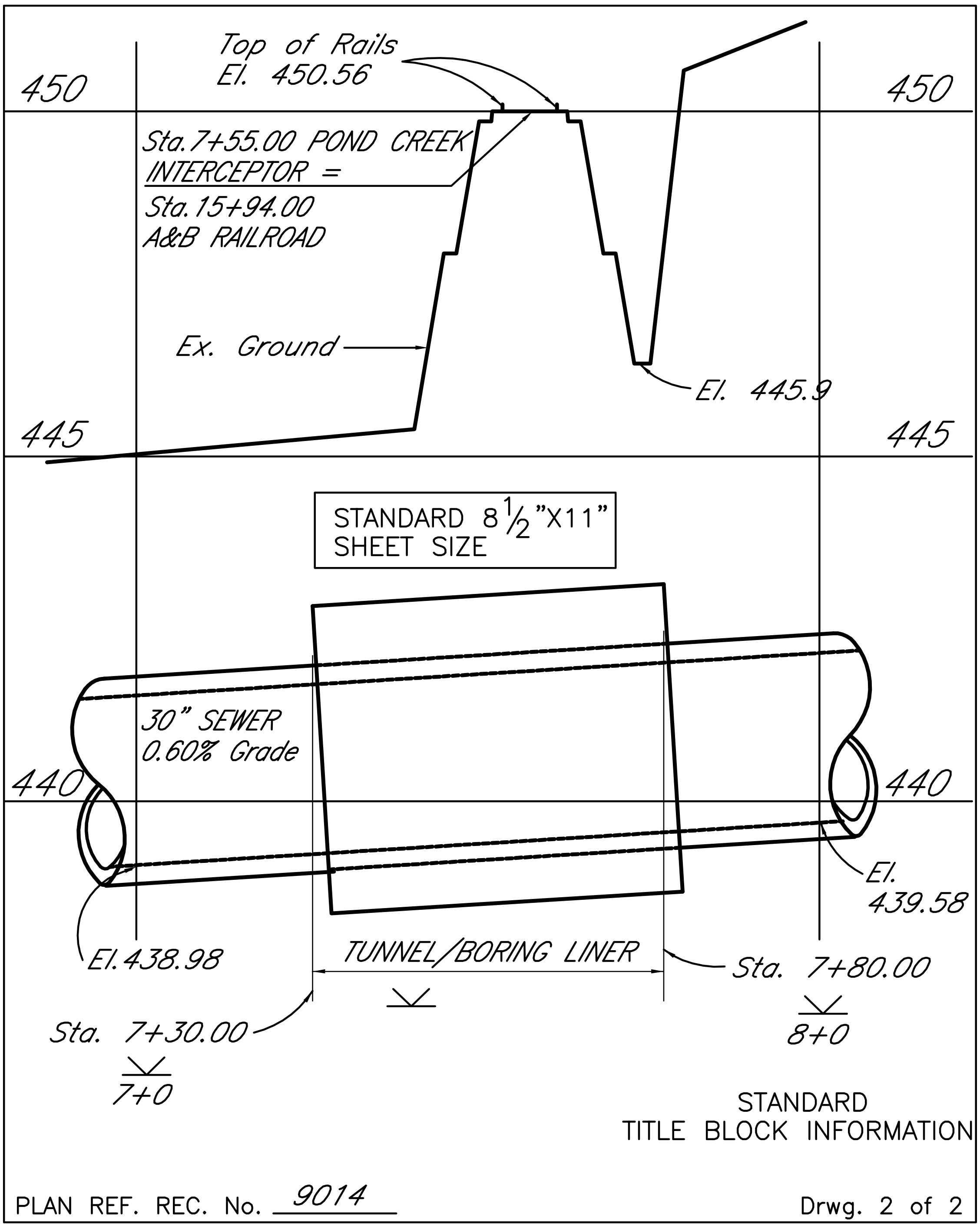
A	4575	Denotes elevation and service line that drains thru basement wall with no sump pump.
B	4535	Denotes elevation and service line that drains thru the basement floor.
C	4575	Denotes elevation and service line in basement with a sump pump raising wastewater from basement floor.
D	4585	Denotes elevation of ground at the point of service line outlet when house has crawl space.
E	4605	Denotes first floor elevation.

This legend shall be used in preparation of preliminary plans. The final plans and profiles shall indicate the proper symbol and elevation for only those houses controlling the sewer.

GENERAL NOTES:
1. The intent of the sewer program is to serve only sanitary facilities in basements and not floor drains, foundation drains, window wells or other such facilities.
2. Where roadside ditches occur, the sewer must be placed at an elevation such that the property service connection at the ditch will have a minimum cover of 1' from the flow line of the ditch to top of encasement or can.
3. Reference Section 12.14.b of the Design Manual.

TYPICAL SERVICE CONDITIONS


33'
33'
Ex. 18"RCP
STANDARD 8 1/2"X11"
SHEET SIZE
Sta. 7+30.00
℄ A&B RAILROAD
℄ Ditch
Sta. 7+80.00
Sta. 7+55.00 POND
CREEK INTERCEPTORS
Sta. 15+94.00
A&B RAILROAD
90° 00'00"
R.P.
15"
Flow
30" Sewer
S
7+0
S
8+0
15" Sewer &
Drain. Esmt.
15" Sewer &
Drain. Esmt.
54" TUNNEL/
BORING LINER
Split
Switch
RAILROAD R/W
RAILROAD R/W
3686'± To Mile
Post No. 10
STANDARD
TITLE BLOCK INFORMATION
PLAN REF. REC. No. 9014
Drwg. 1 of 2


Top of Rails
El. 450.56
450
450
Sta.7+55.00 POND CREEK
INTERCEPTOR =
Sta.15+94.00
A&B RAILROAD
Ex. Ground
El. 445.9
445
445
STANDARD 8½"X11"
SHEET SIZE
30" SEWER
0.60% Grade
440
440
El.
439.58
El.438.98
TUNNEL/BORING LINER
Sta. 7+80.00
8+0
Sta. 7+30.00
7+0
STANDARD
TITLE BLOCK INFORMATION
PLAN REF. REC. No. 9014
Drwg. 2 of 2

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CHAPTER 13
DEVELOPMENT SANITARY SEWER CONSTRUCTION

CHAPTER 13

DEVELOPMENT SANITARY SEWER CONTRUCTION EXHIBITS

CHAPTER 13
DEVELOPMENT SANITARY SEWER CONSTRUCTION

13.1 PURPOSE

This chapter establishes the submittal requirements to the New Albany Sewer Board for private development sanitary sewer projects. See Chapter 11 "Private Development Drainage" for the New Albany Stormwater Board and Floyd County Stormwater Department approval processes and submittal requirements for private development drainage projects. Sanitary sewer systems should be designed in accordance with the applicable provisions of this and other chapters of the New Albany Design Manual. Adherence to these procedures will facilitate timely review and approval for construction.

13.2 NEW ALBANY SEWER BOARD REVIEW

The sanitary sewer facilities for a proposed development in New Albany must be reviewed and approved by the New Albany Sewer Board. The applicant shall meet with the Sewer Board during the planning phase of development to discuss the feasibility of the sanitary sewer design and to ensure the availability of **sewer credits** before creating final construction plans. Refer to Exhibit 13-1 for a checklist of submittals required for the New Albany Sewer Board review process for development projects. For connection of a new single-family residence, sewer credits are not required but the location of the sewer tap must be approved by the Sewer Utility. For all other developments, the Sewer Board review process and submittal requirements are discussed below.

A. Preliminary Review

For new developments connecting to the public sewer (other than single-family residences), a meeting should be arranged by the developer with the New Albany Sewer Board to discuss a proposed sewer plan and if sufficient **sewer credits** are available. A preliminary plan shall be submitted identifying the limits of the project. The preliminary plan should generally show a location map, the lot layout, proposed sewer alignment, existing sanitary sewer, and the number of customer service connections. If the proposed sewer includes a pump station then a concept plan, as described in Chapter 14 of this design manual, shall be submitted with the preliminary submittal. The preliminary submittal shall also include an Application for Sewer Credits and the proposed development's flow projections to show how the amount of sanitary sewer credits was determined. The Application for Sewer Credits is located in Exhibit 13-2 and on the New Albany website: www.cityofnewalbany.com under the wastewater department page. Sanitary sewer credits must be secured from the Indiana Department of Environmental Management (IDEM) and the New Albany Sewer Board prior to design approval and connection to the sewer system. Furthermore, for developments with an average wastewater flow of 15,500 gallons per day or greater a US EPA approved capacity certification is required before construction.

B. Final Review

After receiving preliminary approval and receiving the necessary sewer credits, the final submission to the New Albany Sewer Board for approval of sanitary sewer facilities shall include the following items:

1. Sanitary Sewer Construction Plans and Specs

One copy of the final sewer plans shall be submitted on 24”x36” size sheets as well as one digital copy containing both AutoCad and PDF file formats. One hard copy and one digital copy of the sanitary sewer specifications shall also be submitted. A Professional Engineer and/or Professional Land Surveyor (where applicable per IC 25-21.5-1-7) that is licensed in the State of Indiana shall seal, sign, and date each sheet of the sewer plans. A Professional Land Surveyor, licensed in the State of Indiana, shall seal, sign, and date any sheets with Boundaries shown. Drafting standards shall be according to Chapter 4 “CADD Standards” of this design manual. Plan requirements for the respective sheets are identified on the Minimum Requirements Checklist for Sanitary Sewer Construction Plans in Exhibit 13-3. The sanitary sewer plans and specifications shall be in accordance with the Indiana Administrative Code 327 IAC 3, this design manual, and the New Albany Standard Specifications for Lift Stations (if applicable).

The information for all connections must be shown on a Property Service Connection Inlet Sheet. A copy of the sheet should be placed in the plans for construction and record drawings. An example sheet can be found in Exhibit 13-4.

The use of New Albany’s standard details is required. The standard details are located in Appendix A of this design manual. Nonstandard details and deviations from the standard details will need to be shown within the plan set. Deviations from the standard details must be approved by the New Albany Sewer Board.

2. Flow Projections and Calculations

The flow projections and sewer design calculations shall be as described in Chapter 12 “Sanitary Sewer Systems” of this design manual and included in the final submittal. New Albany may require improvements to downstream facilities in order to accommodate the flow from the proposed development.

If the proposed sanitary sewer design includes a pump station, the design calculations for initial and ultimate flow conditions, as described in Chapter 14 “Pump Stations” of this design manual, shall be included in the final submittal. The pump station design shall be in accordance with Chapter 14 of this design manual and the New Albany Technical Specification for Lift Stations found in Appendix C of this manual. Odor control calculations shall also be submitted with the pump station design in order to determine if odor control measures are needed (see Chapter 15 “Odor Control” of this design manual).

3. Approval by IDEM (if required)

For developments requiring a sewer extension to New Albany's sewer system, a Sanitary Sewer Construction Permit issued by IDEM must be obtained showing that the sanitary sewer design is in accordance with Indiana Administrative Code 327 IAC 3. A copy of the permit and permit approval letter shall be submitted to the New Albany Sewer Board.

4. Correspondence with other Utilities

Documentation must be provided showing that potential conflicts with the sanitary sewer and existing utilities have been addressed to the satisfaction of the utility company. New Albany must be copied on all letters and transmittals to and from the various utility companies.

5. Other Permits

Documentation must be provided showing that all applicable permits have been obtained for the construction of the sanitary sewer, such as encroachment permits, railroad crossing permits, stream crossing permits, etc. New Albany must be copied on all letters and transmittals to and from the various regulatory agencies.

6. Easement Plats (if required)

Two copies of any sewer and drainage easement plats required for the proposed development shall be included with the final submission of documents.

7. Record Plat

A copy of the record plat for the development must be submitted in order for New Albany to determine whether or not additional sewer and drainage easements will be required. Before the New Albany Sewer Department will allow sanitary sewers to be accepted and put into service, all public sewers must be in public rights of way or in a public easement.

8. Erosion Prevention and Sediment Control (EPSC) Plan

The developer must submit a plan for erosion prevention and sediment control (EPSC). The EPSC plan must include the actual depths and locations of all control measures. The EPSC plan must be stamped and sealed by an Indiana licensed Professional Engineer or Professional Land Surveyor (where applicable per IC 25-21.5-1-7). See Chapter 8 "Erosion Prevention and Sediment Control" for EPSC measures.

C. Construction Phase

The New Albany Sewer Department will issue an approval letter after all final design submittal requirements are provided and deemed satisfactory. Construction of the sanitary sewer must commence within one year of approval.

1. Bonds

New Albany requires that a Performance Bond be posted covering the cost of sewer facilities construction during construction. New Albany will require that a Maintenance Bond be posted in the amount calculated by New Albany ($5,000.00 minimum plus $50 per LF under roads and $25 per LF outside of pavement). After the project has been accepted by New Albany, a one-year warranty period begins. If there are no problems with the facilities after one year, New Albany will release the bonds.

2. Accepted Bid Proposal

New Albany requires that the lump sum cost for the construction of the sanitary sewers be submitted. The lump sum amount shall be the same as the amount shown on the Performance Bond.

3. Wastewater Facilities Contract

This document is the legal agreement between the developer and New Albany regarding the construction of sanitary sewerage facilities. It conveys the sewerage facilities to New Albany, upon completion and acceptance by New Albany. The developer agrees to construct the project according to the plans and specifications and to furnish record drawings once the job is finished. New Albany agrees to inspect the work, and to accept ownership of the facilities, along with operation and maintenance responsibilities, once they are completed according to plans and specifications.

4. Inspector

The New Albany Sewer Department will provide part-time inspection as-needed for the construction of all sanitary sewer systems. Construction of sewers shall not begin in a development until an inspector has been assigned to the construction site. New Albany requires 3 working days advanced notice to schedule an inspector for a project.

5. Construction Field Changes

Deviations from approved construction plans as a result of unexpected field conditions will require documentation and approval by the New Albany Sewer Board. To obtain this approval, the contractor shall submit three (3) copies of the marked-up (REDLINE) plans showing the proposed revisions. Upon acceptance of the changes, the New Albany Sewer Board will mark the REDLINE drawings approved, sign and date the approval and send the REDLINES to the construction site via the inspector. One copy will be for the contractor, one copy for the inspector and one copy for the New Albany Sewer Board file.

6. Close-Out Procedures

After completion of the sewer installation, the Contractor, in accordance with Chapter 12 “Sanitary Sewer Systems” of this design manual, shall conduct a low-pressure air test and deflection test (for flexible pipe) of all sewer lines and vacuum test all manholes. The Contractor shall notify the New Albany Sewer Department 48 hours before testing. After all tests have passed and appropriate restoration of the disturbed area has been completed in accordance with the Erosion Prevention and Sediment Control Plan, and all other close out criteria are met, the New Albany Sewer Board will accept the sewers and release the lines for connections.

7. Record Plans

At the completion of construction, final record (as-built) drawings of the construction plans bearing the Land Surveyor's and/or Professional Engineer’s original seal, signature, and date, and incorporating all approved changes shall be submitted to the New Albany Sewer Board. Final record drawings shall be prepared in accordance with Chapter 5 “Final Record Drawings” of this manual. Information regarding the property service connections (PSC) shall be shown on the record drawings. This information includes the location of the PSC in relation to the sewer along with the length, size, and depth of the PSC. The developer shall submit one hard copy of the final record drawings and one electronic copy containing both AutoCAD and PDF file formats. New Albany’s inspector will coordinate and check the work prior to submitting the record drawings to the New Albany Sewer Board. The as-builts must be completed and approved before the New Albany Sewer Board will make the sewers available for connection. Record plans shall be sent to the following address:

New Albany WWTP
38 West 10th Street
New Albany, IN 47150
Phone Number: (812) 948-5320

New Albany Sewer Board
Submittals for Private Development Sanitary Sewer Review

Preliminary Review

- ☐ Preliminary Plan
- ☐ Concept Plan (for Pump Stations)
- ☐ Flow Projections
- ☐ Application for Sewer Credits/ Sewer Credit Approval
- ☐ US EPA Capacity Certification (for developments with an average wastewater flow of 15,500 gpd or greater)

Final Review

- ☐ Sanitary Sewer Construction Plans and Specs- Hard Copy
- ☐ Sanitary Sewer Construction Plans and Specs- Electronic Copy
- ☐ Flow Projections
- ☐ Design Calculations
- ☐ IDEM Sanitary Sewer Construction Permit
- ☐ Correspondence with other Utilities
- ☐ Other Necessary Permits
- ☐ Easement Plats
- ☐ Record Plat
- ☐ Erosion Prevention and Sediment Control Plan

Construction

- ☐ Performance Bond
- ☐ Maintenance Bond
- ☐ Accepted Bid Proposal
- ☐ Wastewater Facilities Contract
- ☐ Record Drawings

New Albany Sewer Board

Application for Sewer Credits

Date of Application: ______________

Name of Applicant: ____

Applicant Address: ____
____
____

Telephone: ( ) ______________________________

Project Name: ____

Project Location: ____
(address or description) ____
____

Description of Project: ____
(include phases & timing) ____
____
____
____

Estimated date when project is fully complete: ____________________

Total credits needed for project: ____________________
(attach flow projections and calculations)

Credits needed for the next 3 years: ____________________

Anticipated construction start date once credits are granted: ________________
(i.e. complete project design, obtain IDEM construction permit, etc.)

Estimate of sanitary sewer connections for the project in: Year 1: ________________
Year 2: ________________
Year 3: ________________

MINIMUM REQUIREMENTS CHECKLIST FOR SANITARY SEWER CONSTRUCTION PLANS

RECORD NO. ______________
(New Albany Use Only)

__ Apt or Condo Chart of No. of Bedrooms
__ Backfill Type
__ Bench Marks
__ Bench Mark Datum **(NAVD 88)**
__ Blue Line Stream Crossings
__ Collar Height
__ Concrete Caps
__ Concrete Encasements
__ Connection Symbols
__ Developer's Name,Address,Tel No.
__ Drop Inlets
__ Easements (existing) Labeled (with DB and PG numbers)
__ Easements (proposed) Labeled
__ Electrical Lines (proposed, existing)
__ Engineer's Seal (signed and dated)
__ Existing Ground (shown and labled)
__ Flow Arrows
__ Gas Lines (proposed, existing)
__ Graphic Scale
__ House,Apt,Lot No.'s Shown
__ Hundred Year Flood Plain (Plan and Profile)
__ Invert Elevations
__ Legend
__ Line Designation
__ Location Map
__ Lot Lines
__ Lot Dimensions and Bearings
__ Manhole Numbers
__ North Arrows
__ Owner's Name,address, Tel No.
__ Pipe Type
__ Private Sewer in Title Block
__ P. I. Stations and Angles (Horizontal)
__ P. I. Stations (Vertical)
__ Plan Date
__ Proposed Grade (ground, roads,etc.)
__ Railroad Lines
__ Resurfacing Limits
__ Record Number
__ Rights-of-Way (proposed and existing)
__ Rim Elevations on Manholes
__ Scale of Drawing
__ Sewage Plant that will Treat Flow
__ Sewer Grades
__ Sewer Sizes
__ Stacks
__ Standard Notes
__ Stationing
__ Station Equations
__ Storm Facilities (proposed and existing)
__ Street Names
__ Stubs
__ Surrounding Property Owner's Name,Local Address
__ Surveyor's Seal (signed and dated)
__ Surveyor's Certification
__ Topo (existing)
__ Tunnels and Bores (plan, profile, sections)
__ Water Lines (proposed and existing)
__ ______________________________
__ ______________________________
__ ______________________________
__ ______________________________
__ ______________________________
__ ______________________________

NEW ALBANY SEWER BOARD

PROPERTY SERVICE CONNECTION INLET SHEET

Project Name: ______________________________ Assm't ___ Int ___ Lat Ext ___ Rec No: ____________ Sht No: ______ of ______

Line: ____________ Accepted by New Albany Inspector __________________ Date ____________

Tap Station on Sewer / Tap Station on P/L	Size / Location of PSC on lot **	Side / Elev.	Length / Depth @ End	Tax Block/ Lot No. / House No.	Street Name	Connection Location - Distance & Direction from MH / End Location - Distance & Direction from PL Corner	Closest MH Number / Nodes UP/DN Stream (by New Albany)	Description of Location of MH (by New Albany) / Line Segment Numbers FROM - TO (by New Albany)	Remarks
T						MH			
P/L						P/L			
T						MH			
P/L						P/L			
T						MH			
P/L						P/L			
T						MH			
P/L						P/L			
T						MH			
P/L						P/L			
T						MH			
P/L						P/L			
T						MH			
P/L						P/L			
T						MH			
P/L						P/L			
T						MH			
P/L						P/L			
T						MH			
P/L						P/L			

** Abbrev. for "Location of PSC on lot"

RW - Right of Way (Front); **OA** - Open Area; **EMF** - Esm't, Front; **EMS** - Esm't, Side; **EMR** - Esm't, Rear; **CU** - Cul de sac; **AL** - Alley, Rear; **ALS** - Alley, Side

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CHAPTER 14
PUMP STATIONS

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CHAPTER 14
PUMP STATIONS

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CHAPTER 14
PUMP STATIONS

CHAPTER 14
PUMP STATIONS

14.1 PURPOSE

This chapter:

A. Identifies the planning and design approach to be used for small pump stations (defined as those less than 700 gpm peak flow and/or up to 80 feet TDH). Pump stations outside of this criteria will be considered on a case-by-case basis.

B. Defines specific criteria for the design of small, sanitary pump stations and their associated force mains.

C. Delineates submittal requirements required by New Albany for review and approval of small pump stations.

D. Delineates requirements for opinions of construction and operating costs.

E. Pump stations must satisfy the regulations of agencies having jurisdiction. Pump stations, at a minimum, shall conform to this document, the City of New Albany Technical Specification for Lift Stations (see Appendix C), the regulations of the Indiana Department of Environmental Management (IDEM) and the Indiana Administrative Code 327 IAC 3.

14.2 SUBMITTAL REQUIREMENTS

The Design Engineer shall submit the Concept Plan and Final Design submittals to the New Albany wastewater utility manager for review and approval. Approval by New Albany will be required prior to authorization of any succeeding design phase.

14.2.1 Concept Plan Submittals

The purpose of a Concept Plan is to provide New Albany with preliminary design data for proposed facilities (gravity sewers, pump stations, force mains). The Concept Plan is used to justify alternatives recommended for providing sanitary sewer service.

Concept Plan submittals relating to pump stations shall include the following elements.

A. Project Background

1. Narrative description of the proposed service and drainage areas that can be served by the proposed facility.

2. Description and reference to any Facilities Plan and/or Capacity Assurance Plan requirements that relate to the proposed service area (on-site area to which service will be provided) and drainage areas (off-site areas that can be served with the proposed facilities).

3. Topographic map showing the boundaries of the proposed service and drainage areas.

B. Existing Environment

1. Existing land use for the proposed service area, adjacent areas, and drainage areas, delineating project area or development site.

2. Existing hydrology, land features, floodplains, geological characteristics, surface conditions, subsoil conditions, and water table details.

C. Existing Collection System

1. Current sanitary sewer and stormwater collection system maps for the proposed service area, drainage area, and surrounding area.

2. Details of existing system to which a proposed gravity sewer or force main may connect. Capacity of existing sewer system to receive flow from force main or future gravity sewer if temporary pump station is installed.

3. Locations of streets, alleys, unusual obstructions, required rights-of-ways, and all similar data that may help to define the physical features of a proposed sewer project.

D. Future Conditions

1. Designated land use for the proposed service area, drainage area, and surrounding area.

2. Population and flow projections for the proposed service area and drainage area.

3. Types of development, i.e., residential, commercial, or industrial.

4. Location of future roads, parks, industrial areas, subdivisions, etc., which may affect the routing and location of sewers and force mains.

5. Construction phasing to accommodate proposed development.

E. Pump Station Justification

In many cases, pump stations are unavoidable and necessary to provide service to a new area. The need for a sanitary pump station must be justified according to one or more of the following criteria. Compliance with one or more of the following criteria does not relieve the designer from the requirement to evaluate alternatives if portions of the service area do not satisfy these conditions:

1. The pump station is recommended in an approved Facilities Plan and/or Capacity Assurance Plan; or

2. The elevation of a proposed service area is too low to be served by existing or future on-site or off-site gravity sewers; or

3. Interceptor sewers, planned by New Albany, are not in place; or

4. The proposed sanitary pump station has been determined to be a cost-effective alternative to an on-site or off-site gravity sewer. To justify a pump station using these criteria, alternatives must be developed and evaluated as described in the following two sections.

F. Development of Alternatives

The following are minimum alternatives to be considered when a cost-effectiveness study is required as part of the pump station justification.

1. Gravity Sewer to Existing Collection System:

   Provide description and preliminary drawings to illustrate existing facilities, proposed facilities, and connection.

2. Interim Solutions:

   Temporary pump stations that provide service until permanent interceptors or other facilities are constructed.

3. Other Possible Solutions:

   a. Consolidation with other pump stations.

   b. Address sewer connections that are not cost-effective due to site conditions or not possible due to elevation differences, individually.

   c. Grinder pumps for individual homes or small clusters of homes.

4. Pump Station Construction:

   Provide description and preliminary drawings to illustrate existing facilities, proposed facilities, and connection.

G. Evaluation of Alternatives

   The alternatives shall be evaluated based on a cost-effectiveness analysis outlined in Section 14.3.4. The analysis shall be performed on each alternative and include both economic and non-economic factors.

14.2.2 Final Design Submittals

Final design submittals relating to pump stations shall include the following elements:

A. New Albany standard specifications modified to specific project needs with additional diagrams and technical data as necessary to construct the proposed installation.

B. Flow projections and calculations.

C. Wetwell calculations.

D. Force main calculations.

E. Pump curves/system curves in feet of total dynamic head versus flow in gallons per minute with the following labels: Pump Curve; Single Pump Operation Curve; Two-Pump Operation Curve; Three-Pump Operation Curve (if applicable); Design Point(s); shut-off head; and Operating Point(s) and Operating Envelope.

F. Total hydraulic efficiency at operating point(s).

G. Pump cycle time.

H. Valve configuration.

I. Pump on-off setting calculations.

J. Buoyancy calculations.

K. Force main pressure, water hammer, and cyclic fatigue calculations.

L. Determinations for air release, air/vacuum, and/or sewage combination air valves.

M. Odor control calculations and/or assumptions.

N. Electrical calculations and/or power requirements (refer to Section 14.5 for specific requirements).

O. Opinions of capital and operation and maintenance costs. Energy efficiency is to be considered in the design.

P. Site plans showing details of pump station, wet well, valve vault, site access, landscaping (if applicable), and electrical utility pole or service rack location.

14.3 DESIGN APPROACH

14.3.1 Compliance with Capacity Assurance Plan and/or Facilities Plan

Proposed construction or expansion of sanitary pump stations shall be in compliance with Capacity Assurance Plan and/or Facilities Plan.

14.3.2 Approvals

Prior to construction or expansion of a sanitary pump station, the design documents must receive the approval of the following agencies and be signed and sealed by a Professional Engineer currently registered in the State of Indiana:

A. New Albany Sewer Board

B. Indiana Department of Environmental Management (IDEM)

C. Others as needed (USACE, health department, INDOT, etc.)

14.3.3 Service Level

Guidelines presented in this Design Manual govern the planning and design of small pump stations defined as follows:

A. Range in size up to 700 gallons per minute (peak flow) and/or up to 80 feet of total dynamic head.

B. Proposed construction or expansion of sanitary pump stations exceeding the stated ranges will be considered by the New Albany Sewer Board on an individual basis.

14.3.4 Cost-Effectiveness Analysis

The cost-effectiveness comparison analysis between a pump station and gravity sewer shall include both economic and non-economic factors.

A. Economic Factors

The economic portion of the cost-effectiveness analysis shall use a present worth calculation that considers capital costs, operation and maintenance costs, and salvage values.

Capital costs shall include opinions of construction cost as outlined in Section 14.6, engineering costs based on recognized fee curves and costs for acquisition of properties, easements and rights-of-way, including legal costs. Operation and maintenance costs shall include opinions of cost for labor, utilities, maintenance and repair of facilities. Salvage values shall be developed on straight-line depreciation.

Life cycle costs should be considered over a 20-year period. Unless otherwise directed by the New Albany Sewer Board, a discount rate equal to that required by IDEM should be used to calculate the present worth value of each alternative.

B. Non-Economic Factors

1. Environmental Impact: The short-term and long-term impacts of the alternative on the environment.

2. Reliability: A measure of how dependable the alternative performs over time.

3. Operability: The ease with which the alternative operates over time.

4. Constructability: The ease with which an alternative can be constructed and phased into operation.

5. Resistance to vandalism.

6. Aesthetics and comments on neighborhood/property owner acceptance.

14.4 DESIGN CRITERIA

14.4.1 Definitions

A. Design Average Daily Flow: Refer to Chapter 12 Section 12.8.3.

B. Peak Flow: Design Average Daily Flow x peaking factor (per 327 IAC 3-6-11 and Chapter 12 Section 12.8.3).

C. Initial Average Flow: Average Flow estimated from the Initial population.

D. Initial Peak Flow: Initial Average Flow x peaking factor.

E. 20-Yr. Average Flow: Average Flow estimated from the 20-yr. population projection.

F. 20-Yr. Peak Flow: 20-yr. Average Flow x peaking factor.

G. Ultimate Average Flow: Average flow estimated from the Ultimate population projection.

H. Ultimate population is defined as the population halfway between 20-year population and watershed saturation population.

I. Ultimate Peak Flow: Ultimate Average Flow x peaking factor.

J. Watershed Saturation Population: The maximum projected population for the watershed based on present zoning.

K. Emergency Response Storage Volume: Ultimate Average Flow x 120 min.

14.4.2 General

Flow projections for developed and undeveloped areas that are used to design pump stations shall be as defined in Chapter 12. Flow projections should be prepared by the Design Engineer and submitted to the New Albany Sewer Board for approval.

Pump station peaking factors should be the same as sanitary sewer peaking factors, which includes anticipated wet-weather flows.

Pump stations shall be of the wetwell type utilizing submersible pumps. With prior approval, pump stations with average minimum flow between 0.25 MGD and 1 MGD, may be designed as wet well/dry pit type. They shall operate automatically under normal conditions, but be capable of manual control. Pump stations shall be planned and designed to include provisions for ease of future elimination. Precast concrete or cast-in place concrete wetwells are acceptable.

All pump stations with an average daily flow greater than 50,000 gallons per day shall have a mechanical building on site for mechanical storage and to house electrical equipment. The building shall be designed so that it will not detract from the appearance of the surrounding vicinity. See the New Albany Technical Specifications for Lift Stations (located in Appendix C) for the mechanical building specifications.

The tops of the pump station wet well and valve vault shall be designed to an elevation at least 2 feet above the 100-year flood elevation or the pump station wet well and valve vault shall be flood proofed to provide maximum protection against flooding while still permitting operation. The pump controls must also be located 2 feet above the 100-year flood.

Pumps shall be sized such that the pumping capacity, with the largest pump out of service, will handle the peak design flow condition.

All plug and check valves shall be installed horizontally in shallow concrete valve vaults next to the wetwells. There must be sufficient vertical clearance in the valve vault for the combination air and vacuum relief valve. The arrangement shall provide for easy access to the equipment to facilitate maintenance. Valve vaults are confined spaces; therefore, they require adequate means for ingress and egress, including OSHA approved ladders and access hatches of sufficient size.

If the pump station is provided with potable water service, the service line shall have a backflow preventer and/or a pressure vacuum breaker ASSE #1020 or a reduced pressure zone ASSE #1013 installed to prevent possible cross connections to the potable water supply. The service line shall be installed in compliance with the applicable water company regulations.

Each pump station shall be accessible via a bituminous or concrete access road with a minimum width of 12 feet to accommodate maintenance truck traffic. If the station is located on a dead-end street, a paved turn area shall be provided. Road construction shall meet current New Albany street specifications. Pavement shall be one inch INDOT HMA surface over two inches INDOT HMA binder over nine inches INDOT 73 DGA. All thickness refers to compacted thickness. The design of the access road must also allow for a Vac-con truck to have access to the wet well for cleaning and be able to support the weight of the vehicle.

Fencing and seeding/sodding of the pump station site shall be per New Albany's Technical Specification for Lift Stations and will be reviewed on a case-by-case basis.

To ensure uniformity and system compatibility, New Albany has prepared a standard specification for a typical pump station (see Appendix C). The Design Engineer should use the information that is provided herein to customize these documents in order for the installation to meet the specific project needs. The Design Engineer shall be responsible for the design of the system. Any deviations from the standard specification must be approved by the New Albany Sewer Department.

14.4.3 Process

14.4.3.1 Wetwell

Wetwells shall be designed for the ultimate peak flow. The cycle of operation for each pump shall not be less than 15 minutes and the maximum detention time in the wetwell shall average no more than 30 minutes.

The wetwell volume for optimum operation shall be computed as follows:

$$V = (\phi q)/4$$

Where:

V = Required operating capacity in gallons (from the lead pump on elevation to the pumps off elevation)

ϕ = Minimum time of one pumping cycle in minutes, from start to start. Ideally ϕ = 15 minutes (maximum 30 minutes; minimum 12 minutes)

q = Pump capacity in gallons per minute (use ultimate peak flow)

Detention times for both initial average flow and ultimate average flow conditions shall be computed.

Wetwell volume shall be based on a maximum draw down depth of 4 feet between the lead pump on elevation and the pumps off elevation.
The design of the pump station shall incorporate a minimum two-hour emergency response storage volume based on ultimate average flow conditions as stipulated under Section 14.4.1. The required volume must be provided in the wetwell and/or a separate, self-draining surge tank between the high wetwell alarm elevation and the invert elevation of the lowest influent gravity sewer. The two-hour emergency response storage volume may be waived by New Albany if two sources of electric service are provided or there is an emergency generator permanently installed at the pump station. Unless specifically prevented by site conditions, the Design Engineer shall layout the collection system and pump station such that the top of the wetwell or nearest upstream manhole is at least two feet below the lowest building floor elevation receiving sewer service. In the event that emergency response measures are overburdened, this will provide a point of relief to prevent backups into homes and the adverse impacts on public health and property damage. The Design Engineer shall identify the location and characteristics of the overflow relief point on the Drawings.

Avoid dropping influent flows into wetwells by installing a drop pipe connection on the wetwell interior or exterior to eliminate air entrainment. The wetwell shall be considered as a Class 1, Division 1 hazardous location. Rail packages shall be non-sparking. Further wetwell sizing constraints are detailed in Section 14.5.3, Pump Control.

A manhole shall be located within ten (10) feet of the wet well on the influent line. The influent line shall be constructed of Ductile Iron pipe. This manhole shall provide provisions for bypass pumping. A plug valve shall be placed in the influent line to the lift station. This valve will be used to isolate the wet well.

14.4.3.2 Force Main

Force mains shall be designed for ultimate peak flow conditions and checked for initial and ultimate peak flow conditions to insure the velocity ranges.

Force mains shall be ductile iron conforming to AWWA C151, PVC conforming to AWWA C-900 Class 150 (minimum), or HDPE conforming to ASTM F714. Force main fittings shall be ductile iron mechanical joints rated for a minimum of 150 psi. Refer to the New Albany Technical Specification for Lift Stations in Appendix C for force main requirements.

Sewage combination air valves shall be provided at all high points in the force main. Long horizontal runs and increases in slope may require air/vacuum and/or air release valves, realizing that air release valves are for pockets of air accumulated during operation and air/vacuum valves are to exhaust or admit air during filling or draining the force main. Cleanouts shall be provided at all low points and at additional critical locations. The Design Engineer shall consider and review with New Albany the location of all air release valves, air/vacuum valves, sewage combination air valves and cleanouts.

The Engineer shall provide an economic analysis comparing the installation of air release and air/vacuum release valves against the installation of deeper force main piping. The economic analysis shall take into account the installation and maintenance costs associated with the air release and air/vacuum release valves. Air release and air/vacuum release valves shall be specifically designed for wastewater service and be sized per the manufacturer's recommendations. The air and vacuum release valves will be contained in a vault and vented above ground. A manually controlled isolation valve shall be installed between the force main and the air release or air/vacuum release valves.

Joint restraints or concrete thrust blocks shall be installed at bends. An analysis must be made to determine if a joint restraint is required either upstream or downstream of the bend. For slopes of 20 percent and greater, anchors shall be provided at each joint (at a minimum). A flexible through-wall connector shall be used at pipe penetrations through structures to allow for differential settlement.

Force main design criteria shall be as follows:

A. Minimum Pipe Size

    1. 4-inch I.D. for wastewater pumps

    2. 2-inch I.D. for grinder pumps

B. Design Pipe Roughness Coefficient (C)

1.	PVC	C = 120 and 150
2.	Lined Ductile Iron	C = 120
3.	HDPE	C = 120

C. Velocity (V) Range

    1. V = 2.0 to 5.0 feet per second (fps) for wastewater pumps

    2. V = 3.0 to 5.0 fps for grinder pumps

Note: A maximum velocity of 6.0 fps is allowable with a present worth economic calculation that considers capital and operating costs in order to justify any increase above 5.0 fps.

14.4.3.3 System Head Curve

The pump/system curve calculation may be performed utilizing any acceptable hydraulic equation.

The system head curve is a plot of the flow through a pipe system against the head losses as a result of friction losses, minor losses, and elevation differences in the pipe system. Selection of pump size shall be based on static head and total dynamic head. The design operating point is at the intersection of the pump curve and the system curve. Also, the pump should be selected such that the shut-off head exceeds the pumping head at peak Q.

Static head or static pressure (h_s) shall be based on the average elevation of lead pump on/off:

h_s = (Elevation of highest point in force main) - (Average elevation of lead pump on/off)

Minor losses through fittings and valves shall be computed by multiplying the velocity head by the minor loss coefficient:

$h_m = K*(V^2/2g)$

Where:

K = Minor loss coefficient

V = Velocity (feet per second)

G = Acceleration of gravity = 32.2 (feet per second squared)

Friction losses (h_f) in the force main can be computed according to the Hazen-Williams formula as follows:

$h_f = (10.44)\ (L)\ (q)^{1.85}- / [(C)^{1.85}\ (d)^{4.8655}]$

Where:

L = Length of pipe (feet)

q = Flow rate (gallons per minute)

C = Hazen-Williams friction loss coefficient

d = Pipe diameter (inches)

Compute total dynamic head as follows:

TDH = Static Lift + Friction Loss + Minor Loss = $h_s + h_f + h_m$

The TDH shall be calculated for the design roughness coefficient as stated in Section 14.4.3.2. All applicable system curves shall be plotted on the pump curve submitted.

The operating point for the selected pump shall be in the range of initial peak flow to ultimate peak flow as determined by the Design Engineer. The pump efficiency at the operating point should be within the acceptable operating range of 60 to 120% of the capacity at the best efficiency point. The selected pump must be approved by the New Albany Sewer Department.

The pump efficiency shall be included in the final design submittal. Grinder pump efficiencies may be obtained from the manufacturer. During pump selection, the system should be checked for low static head conditions (i.e., full wetwell condition) and high static head conditions. The minimum and maximum head curves shall be plotted on the pump curve. This check is performed to insure that in no case will the pump be required to operate outside its normal operating range. Such an occurrence could result in overloading of the motor and eventual pump failure. The motors shall be sized to be non-overloading over the entire pump curve.

When pump stations are proposed to discharge into gravity sewers, the capacity of the gravity sewer receiving the discharge shall be checked to determine the impact on the sewer capacity.

When pump stations are proposed to discharge into existing force mains, an analysis of the existing pump station shall be performed to evaluate the impact of the additional flow in the existing force main and its effect on the existing pump(s) performance. The Design Engineer should check initial and ultimate flow conditions to see if the existing pump capacity is compromised. Conditions should be verified when the existing pump station is pumping and when it is not pumping (on and off). An analysis of the potential for reverse flow through the existing pumps shall be included. If the capacity is reduced, a recommended upgrade to this station should also be presented in conjunction with the proposed pump station design. Approval of systems that discharge into force mains will be evaluated on a case-by-case basis.

14.4.3.4 Buoyancy

Buoyancy shall be analyzed on the wetwell and valve vault to determine whether additional methods of restraint are necessary. Mechanical equipment, water weight, and other temporary loads shall not be included in the analysis. A safety factor of 1.5 (minimum) is required.

Buoyancy Force shall be computed as follows:

Buoyancy Force = (Displaced Volume) x (Unit Weight of Water)

Opposing Force shall be computed as follows:

Opposing Force = Weight of Barrel + Weight of Bottom Slab + Weight of Top Slab + Net Weight of Saturated Soil over Bottom Slab Extension + Any Additional Restraints (Do not include electrical/mechanical components).

Factor of Safety is computed as follows:

$$\text{Factor of Safety} = \frac{\text{Opposing Force}}{\text{Buoyant Force}} > 1.5$$

14.4.3.5 Force Main Pressure and Water Hammer Calculations

From the Uni-Bell Handbook of PVC Pipe, Design and Construction, 1986, water hammer is an increase in pressure in a pipe caused by a sudden change in velocity. The velocity change usually results from the closing of a valve. The maximum surge pressure encountered is a function of wave velocity (a) as follows:

$$a = 4660/(1 + (kd/Et))^{1/2}$$

Where:

a = Wave velocity

k = Fluid bulk modulus, 300,000 pounds per square inch (psi) for water

d = Pipe ID, (inches)

E = Modulus of elasticity of pipe
400,000 psi for PVC pipe
24,000,000 psi for ductile iron pipe

t = Wall thickness (inches)

OR

$$a = 4660 / ((1 + (k/E)(DR-2))^{1/2}$$

Where:

DR = (O.D. (inches)) ÷ (wall thickness (inches))

DR = Dimension Ratio

The maximum surge pressure (P) is computed as follows:

$$P = \frac{aV}{2.31\ g}$$

Where:

V = Maximum change in velocity (velocity goes to 0 feet per second)

g = Acceleration due to gravity (32.2 feet per second-squared)

P = Pressure surge (pounds per square inch)

Total pressure is computed as:

Total Pressure = Maximum Surge Pressure + Static Pressure

$= P + h_s$

Total pressure must be less than the rated pressure of the pipe (rated pressure including surge allowance).

Cyclic Surge (Fatigue) Analysis is determined (for PVC force mains only) as follows:

A. Estimate the number of pump cycles for the proposed system using a design life of 80 years (use 4 cycles per hour and a safety factor of 2.5).

B. Calculate the peak hoop stress (S) using Vinson's formula.

$$C = (5.05 \times 10^{21})\ S^{-4.906}$$

Where:

C = Average number of cycles to failure

S = Peak hoop stress (pounds per square inch)

C. Determine Total System Pressure (P_T)

P_T = Maximum Surge Pressure + Static Pressure

D. Use International Standards Organization (ISO) formula to determine minimum dimension ratio.

$$DR_{required} = (2S/P_T) + 1$$

Where:

DR = Dimension Ratio

S = Peak Hoop Stress

P_T = Total System Pressure

The calculated DR value must be greater than the DR of the selected pipe.

Force main pressure and water hammer calculations for ductile iron pipe shall be based upon AWWA Standards C150/A21.15-91, "American National Standard for the Thickness Design of Ductile Iron Pipe." Calculations for polyethylene pipe shall be based upon AWWA Standards C906 "Standard for Polyethylene Pressure Pipe and Fittings."

14.4.3.6 Odor Control

The Design Engineer shall consider the need for odor control if detention time in either the wetwell or the force main, based on the average flow, exceeds 45 minutes.

Refer to Chapter 15, Odor Control, for specific requirements.

14.5 ELECTRICAL

14.5.1 General

This section provides guidelines for the design and preparation of plans and specifications as related to small sanitary pump station power, control, and telemetry systems. All electrical documents must be signed and sealed by a Professional Electrical Engineer currently registered in the State of Indiana.

All concepts and designs are to strike a balance between function, initial cost, operational cost, and ease of maintenance. Generally accepted designs, materials, and methods are to be used throughout the project. The Design Engineer shall utilize these as a template for completing design. If, however, the Design Engineer identifies an opportunity to take advantage of an innovative design approach, the Design Engineer is to present the proposal in writing to New Albany for evaluation.

14.5.2 Applicable Standards or Codes

All systems, designs and procedures are to meet or exceed the requirements of the latest issue of the following codes or standards:

Indiana Building Code	IBC
National Electric Code	NEC
Underwriters Laboratories, Inc.	UL
Factory Mutual	FM
National Fire Protection Association	NFPA
National Electrical Manufacturers Association	NEMA

Occupational Safety and Health Administration	OSHA
Indiana Occupational Safety and Health Administration	IOSHA

Design should relate to the following specific requirements:

A. NFPA 37 Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

B. NFPA 110 Standard for Emergency and Standby Power Systems

C. NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities.

14.5.3 Pump Control

14.5.3.1 Automatic Operational Sequence

A programmable logic controller (PLC) shall be used for the primary control of the submersible pumps. The PLC shall operate the submersible pumps and shall perform automatic alternation and duplexing for two pumps (or triplexing for three pumps, where applicable). The PLC shall alternate the lead pump once the wetwell level has been pumped down to the stop setpoint (elevation). PLC's shall be Allen-Bradley Micrologix 1000 or Square D Modicon TSX Momentum with the required discrete/analog inputs/outputs. A minimum of 10% spare inputs/outputs shall be provided.

Float switches shall be provided as a secondary control of the submersible pumps in the event of failure of the PLC. A total of four backup float switches are required: low wetwell level, pumps stop, pumps start, and high wetwell level. The float controls shall sequentially start and stop all pumps via relay logic and time delay relays. The controls will operate completely independent of the PLC. Upon activation of the backup start float, both pumps shall automatically start, via time delays to prevent simultaneous starting, and operate in a similar fashion to that of the PLC. When the wetwell level falls below the backup stop level float, both pumps will de-energize and the PLC will take control of the pumps.

A step control or variable level scheme shall be used for the pump control. These schemes shall establish the following sequence of operations:

A. Constant Speed Pumps - The lead pump shall start when the wetwell volume from the pumps "off setpoint/elevation" to the lead pump "start setpoint/elevation" is equal to the volume derived in Section 14.4.3.1. The minimum separation between these elevations shall be 12 inches. If the influent sewage flow into the wetwell is greater than the capacity of one pump, the second and, if applicable, third pumps shall start at ascending, separate levels (start elevations). They then continue to run until the liquid level in the wetwell is pumped down to a predetermined level (stop elevation) for all pumps.

B. Variable speed pumps will be considered on a case-by-case basis.

14.5.3.2 Control Setpoints/Elevations

The PLC shall stop all pumps when the wetwell level is equal to the minimum level recommended by the manufacturer of the proposed pumps plus 24 inches, and a minimum of 12 inches below the PLC controls lead start setpoint. The increment in levels between the PLC control multi-pump start points shall be a minimum of 12 inches.

The backup low wetwell level float shall be located 12 inches below the backup stop float. The backup stop float shall be 12 inches below the PLC stop setpoint. The backup start float shall be 12 inches above the PLC lag pump start setpoint.

The PLC high wetwell level alarm shall be at or lower than the invert of the lowest influent pipe and at least 12 inches above the backup float start elevation. The local high wetwell level alarm float shall be a minimum of 12 inches above the PLC high level setpoint.

14.5.3.3 Level Measurement/Detection

An ultrasonic level transmitter with submersible, Class I, Division 1 ultrasonic level transducer shall be the preferred method of level measurement and shall be incorporated into the pump station operation. The ultrasonic level transmitter/transducer shall be Milltronics HydroRanger transmitter/Milltronics XPS transducer. Proper placement of the transducer is critical to ensure foreign objects (piping, float cables, etc.) do not encroach on the transducer beam angle. The transmitter shall be installed within the pump control panel or rack mounted adjacent to the pump control panel. Where located adjacent to the pump control panel, a sun shade shall be provided to protect the transmitter. The transducer shall be flange mounted to the top slab of the wetwell. This arrangement will allow the Owner to remove the transducer as needed for cleaning and maintenance.

Float switches shall provide back-up pump control and high wetwell level monitoring in the event of PLC failure. The float switches shall be free hanging and suspended by weighted cables. The cables shall be of sufficient length to be installed without splicing. Float cables and pump power/control cables shall be supported from stainless steel level sensor holders via stainless steel strain relief cable grips. The level sensor holder shall be located near the wetwell hatch opening to allow easy access for removal of cables. Intrinsically safe relays shall be installed within the pump control panel for termination of float switches. Float cables shall be provided with Class I, Division 2 sealing connectors where cables enter the pump control panel.

Level detection systems that require maintenance personnel to enter the wetwell to repair or replace components are unacceptable.

14.5.3.4 Control Panel Interface

A graphic touchscreen “human-machine interface” terminal (HMI) shall be provided for indicating status and alarms, and for input from the operator for various control functions. Exceptions are the inclusion of hard-wired Hand-Off-Automatic (H-O-A) selector switches, noted below, and a reset pushbutton for each pump to allow manual operation of the pumps and resetting of motor starter faults without the HMI or PLC.

The H-O-A selector switch shall be provided for each pump and shall be mounted on the dead front of the control panel. In the Hand position the selected pump(s) shall operate continuously until switched to the Off position. In the Automatic position the selected pump(s) shall operate as described above via the ultrasonic level transducer. Hand operation shall not require the PLC to be functional.

A total of three elapsed time meters shall be provided on the dead front of the control panel: one elapsed time meter for each pump and one elapsed time meter for simultaneous pump operation. The run time for each pump shall be displayed on an accumulative type elapsed meter that is non-resettable showing run time in one-tenth hour increments.

A separate ammeter shall be provided on the dead front of the control panel for monitoring the running amperage of each pump motor, Phase A.

A Lead Pump 1 / Lead Pump 2 / Automatic Lead Pump Alternate selector switch shall be provided to select a specific lead pump or for automatic alternation of the lead pump. A “Test-Auto” test switch shall also be mounted on the control enclosure for testing all alarm lights.

The following indicating lights shall be provided on the control panel:

A. Pump Run - indicating light for each pump (labeled as Pump “X” Run). The indicating light shall be lit when the corresponding pump is running.

B. Seal/Failure - indicating light for each pump (labeled as Pump “X” Seal/Failure).

C. Motor High Temperature - indicating light for each pump (labeled as Pump “X” Motor High Temperature).

All switches, indicating lights, push buttons, and ammeters mounted on the pump control panel shall have engraved plastic legend nameplates (white with black letters) – secured with screws – indicating its function.

14.5.3.5 PLC Monitoring

The PLC shall be configured to monitor the following conditions:

A. Pump No.1 Running.

B. Pump No.2 Running.

C. Pump No.1 Seal Leak.

D. Pump No.2 Seal Leak

E. Pump No.1 Motor High Temperature.

F. Pump No.2 Motor High Temperature.

G. Pump No.1 Motor Overload.

H. Pump No.2 Motor Overload.

I. Pump No.1 Lead (via selector switch position).

J. Pump No.2 Lead (via selector switch position).

K. Automatic Pump Alternation (via selector switch position).

L. Pump No.1 In-Auto Position.

M. Pump No.2 In-Auto Position.

N. Pump No.1 In-Hand Position.

O. Pump No.2 In-Hand Position.

P. Pump(s) Off Level (via transducer).

Q. Lead Pump Start Level (via transducer).

R. Lag Pump Start Level (via transducer).

S. High Wetwell Level (via transducer or float).

T. Low Wetwell Level (via transducer or float).

U. Low Temperature (outdoor systems only).

V. Loss-of-phase, phase reversal, or under voltage.

14.5.3.6 Pump Controls Interlock

The following alarms shall automatically de-energize the respective pump(s):

A. Motor High Temperature (de-energize respective pump).

B. Motor Overload (de-energize respective pump).

C. Seal Leakage (de-energize respective pump).

D. Low Wetwell Level (de-energize all pumps).

E. Starter Fault (from reduced voltage solid-state starter on soft started pump motors).

F. Loss-of-phase, phase reversal, or under voltage (de-energize all pumps).

Seal leakage and over-temperature shall be latched in the PLC program until manually reset via "soft buttons" on the HMI on the control panel door. When the backup level controls are energized, motor high temperature and seal failure shall de-energize the pump, however, the pump will be re-enabled if either interlock self-resets, i.e., the motor cools down. Electrical overload relays and soft starters shall be provided with a reset pushbutton on the inner door of the control panel, independent of the PLC or HMI controls.

Loss-of-phase, phase reversal or under voltage condition shall de-energize all pumps in any mode of control. The monitor for these conditions shall reset automatically once the problem parameter falls within its appropriate range. If, upon reset of the monitor, the control system calls for more than one pump, the additional pump(s) shall be energized after a time delay(s) in both the PLC logic or the backup control system relay logic to reduce motor inrush current on the electrical service or the generator.

14.5.4 Alarm System

14.5.4.1 Station Local Alarms

The station shall be provided with a local alarm system powered from the main control panel and powered via an uninterruptible power supply (UPS). The following shall initiate the local alarm.

A. High wetwell level (via transducer or local float)

B. Low wetwell level (via transducer or local float)

C. Power failure

These alarms should annunciate locally via a red flashing light. The light shall remain on during alarm condition and shall de-energize automatically once the alarm condition has cleared.

All control system alarms shall automatically reset when the alarm condition has cleared. An adjustable 0-15 minute time delay relay shall be activated and timed-out prior to transmitting the high wetwell level condition to the dialer.

14.5.4.2 Telemetry

Each station shall be equipped with a wireless remote monitoring system, unless an alternate is approved by the City. The remote monitoring system shall be provided by EIC Contractors, Inc., 800 Sweet Street, Brownstown, IN 47220; P: 812.358.3513; Contact: Sam Motazedi. The system will communicate with the plant SCADA system in the event that an alarm has been activated at the pump station.

The remote monitoring system shall be self-contained in a NEMA 4X, stainless steel enclosure and located adjacent to the pump control panel. The remote monitoring system shall be powered independently from the pump control panel.

The following signals shall be provided as inputs to the remote monitoring system:

A. Pump No. 1 Motor Overtemperature.

B. Pump No. 2 Motor Overtemperature.

C. Pump No. 1 Motor Overload.

D. Pump No. 2 Motor Overload.

E. Pump No. 1 Seal leakage.

F. Pump No. 2 Seal leakage.

G. High wet well level alarm (via transducer or float).

H. Low wet well alarm (via transducer or float).

I. Low temperature (outdoor systems only).

J. Power failure.

14.5.4.3 Battery Back-up

Equipment within the pump control panel shall be designed to operate on 24Vdc. A back-up battery power supply with charger shall be provided to allow operation of the PLC and dialer upon loss of 120-volt power. The battery shall be sufficiently sized to provide a minimum of 6 hours operation.

14.5.5 Pump Station Electrical Criteria

14.5.5.1 General

All pumping stations shall be wired in strict accordance with the latest edition of the National Electric Code. Pumps and equipment shall normally be designed to operate from a 230/460 volt, three-phase power source. All stations shall be powered by a 480-volt, 3-phase, 4-wire wye primary, or a 480-volt, 3-phase, 3-wire delta primary. Engineer shall coordinate incoming electrical service with the local utility company. All stations powered by 480-volts primary shall have a minimum 7.5 KVA single-phase, 480-volt to 120/240-volt, transformer provided for power station controls and miscellaneous equipment (dialer, receptacles, station lights, etc.). Single-phase to three-phase converters will not be allowed.

Single-phase service will be considered by New Albany on a case-by-case basis. Where approved, single-phase pump stations shall have capacitor start-induction run motors. A control power transformer will not be required to facilitate auxiliary equipment when 240/120-volt delivery is available from the utility.

All motor starters and controls shall be located in a shop-assembled control cabinet, located above the 100-year flood elevation.

All conductors shall be insulated, stranded, copper wire, rated at 600 volts.

Pump control cabinets shall be stainless steel or aluminum, NEMA 4X enclosure, suitable for outdoor installation or type NEMA 12 for inside use within the mechanical building as appropriate. Each cabinet shall be equipped with a locking hasp, staple, and three-point latching handle to provide watertight and tamper-proof service and shall be mounted on a wet well electrical rack/pedestal. Each cabinet shall have a hinged inner door, containing all operator control devices, and must be appropriately sized for the application.

All indoor located panel enclosures shall be painted with an epoxy-based enamel coating.

Pump control cabinet shall be dead front with all operators' devices, including HMI, accessible without opening the enclosure door (via lockable switch compartment). All relays, timers, terminal strips, etc., shall be mounted to a subpanel inside the enclosure. All wiring must be stranded and sized to be protected by a 20A/1P circuit breaker, or as required by control panel manufacturer. Supplemental overcurrent protection may be used in lieu of oversized wiring.

The pump control panel shall be provided with a metal data pocket on interior of the control panel door. Elementary control schematics and connection diagrams showing the spatial relationship of components and wiring shall be furnished and stored in data pocket.

Sleeve type wire markers or other "permanent" type markers shall be installed on all wires, keynoted back to the elementary schematic or the connection diagram, and all terminals identified.

Motor starters shall be NEMA-rated magnetic type with a 120 volt control coil, and three ambient-compensated thermal overload relays for three-phase and single phase services with a minimum size of NEMA-1. Reduced-voltage starters shall be provided for motors rated 25 HP or larger, unless more stringent requirements are mandated by the local utility company. Reduced-voltage starters, where required, shall utilize solid-state motor starters with bypass contactors. The solid-state starters shall be used to start and stop the pumps with the bypass contactor utilized for full speed operation. Consult with local utility for motor starting requirements.

All circuit breakers utilized for submersible pumps shall be ground-fault interrupter type.

A surge protection device shall be provided for the pump control panel.

The pump control panel shall be supplied with a thermostatically controlled 120-volt heater sized to maintain panel internal temperature at a minimum 55 F and shall include a low temperature switch, set at 40 F, within the enclosure to alarm failure of heater.

A minimum of one (1) 120-volt, 15-amp receptacle, and one (1) 120-volt, 15-amp GFI duplex receptacle shall be mounted in the control enclosure. An internal panel light, with switch, shall be installed in the electrical enclosure.

An externally mounted NEMA 3R red-flashing globe-type alarm light, with a lexan-type cover and wire shield shall be installed on the outside of the mechanical building, where applicable, visible from the road. The light shall be activated upon a High or Low wetwell level and a normal utility power failure.

Separate pedestal mounted stainless steel (or aluminum) NEMA 4X enclosures shall be provided to facilitate the junction of cords from Class I, Division 1, Group D wet well components with permanent wiring to non-hazardous control panel (starters, PLC, etc.). The junction box shall be mounted a minimum of 36 inches above the wet well top slab. The pedestal shall provide an air gap between the wet well and junction box. The pedestal shall be vented and hinged to allow operator access to cabling within the pedestal. One, two (2) inch diameter aluminum, rigid galvanized steel, or PVC-coated rigid steel conduit per pump must be installed from this junction box to the pumps. The conduit, and all connections, must be sealed at both ends with manufacturer-approved watertight seals, or silicone.

Sun shields shall be provided at all exterior pump control panels. Shield shall be fabricated from minimum 10-gauge aluminum, and shall be designed, fabricated, installed, and supported to fully cover and shade the top, sides, and back of the enclosure, from direct exposure to sunlight. Sun shields shall not be attached directly to the enclosure by drilling holes through, or welding studs to, the enclosure surfaces, and shall be designed and mounted to provide a minimum 1-inch air gap all around the enclosure for air circulation and heat dissipation.

At a minimum, the following key issues must be addressed in the design with calculations and/or NEC references to verify such:

A. Service size.

B. Feeder/service conductor size.

C. Ground conductor size.

D. Feeder/service disconnect size.

E. Branch circuit conductor size.

F. Branch circuit type of protection.

G. Branch circuit over-current protection rating.

H. Motor controllers size and overload protection rating.

I. Pump control system transformer over-current protection.

J. Available fault current.

K. Feeder/service over-current protection.

L. Ground fault protection.

The service conductors, main circuit breaker, transfer switch, and starter branch circuit conductors, must be sized so that the full capacity of the motor starters may be utilized in the future.

14.5.5.2 Emergency Power

A City approved generator hook-up is required for emergency power outage. The switching unit must be type specified by New Albany to prevent feedback and meet all electrical codes for safe operations and to be standardized with existing stations.

A fused double-throw safety switch shall be provided and rated for use as service entrance equipment and shall be housed in a stainless steel, NEMA 4X enclosure. The double-throw safety switch may be installed at the service riser pole or rack-mounted, along with the generator receptacle noted below, adjacent to the service riser pole. Please note that the fused double-throw disconnect switch has a long lead time.

A Crouse-Hinds Arktite Model AR2042, 200-amp, 600VAC / 250VDC, 3-wire, 4-pole (reversed service), body grounded, receptacle shall be installed on the emergency side of the double-throw safety switch for connection to the Owner's portable generator.

14.5.5.3 Site Lighting

An area light shall be installed to illuminate the area, including the pump station wetwell, vault, and control panel. The light shall be installed with a dusk-dawn sensor, and an on-off weatherproof switch, to override the dusk-dawn sensor. The light shall be installed a minimum of 10 feet above the ground or high enough to illuminate the entire lift station area. The light shall be a 1000-watt metal halide. Smaller wattage fixtures may be allowed if point-by-point foot-candle levels are demonstrated, and provide a minimum of 2 foot-candles (maintained level) throughout the entire lift station area.

14.6 OPINIONS OF COST

Opinions of probable cost shall be based on the best professional opinions of the Design Engineer. The Design Engineer should use recent bid tabulations, and information from suppliers and contractors in formulating the opinions of cost. The opinion of cost shall take into consideration capital cost and the cost of operation and maintenance.

14.6.1 Opinions of Capital Cost

Opinions of capital cost shall be grouped by category.

Opinions of capital cost shall include a construction contingency of 10% and should include a cost for necessary land, easement, or right-of-way acquisition.

14.6.2 Opinions of Operation and Maintenance Cost

Opinions of operation and maintenance cost shall include costs for labor, utilities, maintenance and repair. Energy efficiency is to be considered in the design.

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ODOR CONTROL

15.1 ODOR CONTROL JUSTIFICATION

The design engineer shall review the potential need for odor control, evaluate odor control options, and make recommendations in the Concept Plan submittal. New Albany will review the information and consider the need for odor control on a case by case basis according to the following criteria:

A. The history of odor complaints in the vicinity. If New Albany has received odor complaints within 100 yards of the proposed facility within the previous year, odor control may be required.

B. The potential that the facility has to create an off-site odor nuisance. If the facility is fed by upstream pumping stations, if it has collection sewers that have low velocities (<2 ft/sec) and/or long detention times (>6 hours) or if it is expected to receive heavy industrial flow, odor control may be required. On-site odor control will also be required if the wetwell or force main has an average detention time in excess of 45 minutes and may be required with lesser detention times if other conditions warrant it.

C. The proximity of proposed facilities to existing and future homes, businesses and roads. If a home or business is located within 150 feet of the facility, or is expected to be within this distance, odor control facilities may be required.

D. The design calculations performed by the project engineer indicate that odor control is needed. Refer to Exhibit 15-1 “Odor Control System Design Criteria Form”.

15.2 ODOR CONTROL DESIGN PROCESS

If New Albany determines that odor control is required for the proposed facility the design engineer shall refer to Chapter 16 “Odor Control” in the Louisville and Jefferson County MSD Design Manual for submittal requirements and design criteria. The Louisville and Jefferson County MSD Design Manual can be found online at the following web address:

http://www.msdlouky.org/insidemsd/standard-drawings.htm

New Albany Sewer Board
Wetwell Detention Times and Projected Sulfides

Development: ______________________________

Developer: ______________________________

Engineer: ______________________________

Pump Station:

(a)	Initial Average Daily Flow Rate (gpm)		Data Input
(b)	Wetwell Diameter (ft):		Data Input
(c)	Depth from All Pumps Off to Lead Pump On (ft):		Data Input
(d)	Will Pumps have VFDs:	Yes/No	Data Input
(e)	One Pump Flow Rate (gpm):		Data Input
(f)	Number of Pumps:		Data Input
(g)	Distance from Wetwell to Nearest Current or Future Residence (ft):		Data Input
(h)	Distance from Wetwell to Nearest Body of Water (ft):		Data Input
(i)	Does Station Receive Flow from Any Other Pump Station?	Yes/No	Data Input
(j)	Name of Upstream Station:		Data Input
(k)	Volume in Wetwell with Pumps Off (gallons): $V = [3.14*(b)^2/4]*(c)*7.48\ gal/ft^3$		Formula
(l)	Wetwell Detention Time (DT) (min): DT=(k)/(a)		Formula

Force Main:

(m)	Force Main Length (ft):		Data Input
(n)	Force Main Inside Diameter (ft):		Data Input
(o)	Number of Air Release Valves (ARV):		Data Input
(p)	Closest Distance from ARV to Residence (ft):		Data Input
(q)	Distance from Discharge Manhole to Nearest Residence (ft):		Data Input
(r)	Force Main Cross Sectional Area (ft^2): $A = 3.14*(n)^2/4$		Formula
(s)	Force Main Velocity with One Pump Running (ft/s): V = (e)/(r)/7.48/60		Formula
(t)	Force Main Volume (ft^3): V = (m)*(r)		Formula
(u)	Force Main Detention Time at Avg. Daily Flow (min): DT = (t)*7.48/(a)		Formula
(v)	Sulfide Flux Coefficient (ft/hr):	0.001	Given
(w)	Effective Biological Oxygen Demand of Wastewater (mg/L):	280	Given
(x)	Hydraulic Radius of Full Pipe (ft): HR = (n)/4		Formula
(y)	Predicted Total Sulfide Production (mg/L): $S_c = [3.28*(v)*(w)*[(1+0.48*(x)](x)^{-1}]*(u)/60$		Formula
(z)	Predicted Total Sulfide Mass (lbs/day): $S_m = (y)*(a)*60*24/1{,}000{,}000*8.34$		Formula
	Predicted Bioxide Usage (gals/day): B = (z)*1.0		Formula

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CHAPTER 16
LOW PRESSURE SEWER SYSTEMS (LPSS)

CHAPTER 16
LOW PRESSURE SEWER SYSTEMS (LPSS)

16.1 PURPOSE

This chapter establishes the minimum standards and technical design criteria for sanitary Low Pressure Sewer Systems (LPSS) in the City of New Albany service area for Capital Improvement and development projects. Adherence to these standards will expedite review and approval of plans. Hydraulic design presented herein represents acceptable procedures not necessarily to the exclusion of other sound and technically supported design procedures. Any departure from these design requirements should be brought to the attention of New Albany before submission of plans for approval and should be justified and documented. Sanitary LPSS plan preparation for private development must also conform to Chapter 13 requirements and in all cases plan development shall conform to the Chapter 8 EPSC requirements.

16.2 OVERVIEW

16.2.1 General Design

The overall design of LPSS consists of the determination of the following:

A. The location of the horizontal alignment which most efficiently provides service to existing and potential users.

B. The vertical restrictions on establishing the LPSS alignment, including: minimum cover, elevations of other sewers in the system, conflicts with other underground facilities, and solid rock considerations.

C. The design flow generated by the existing and future users, which must be transported by the LPSS.

D. The pipe size, pipe material, and method of construction required.

E. The necessary appurtenances and special structures required.

16.2.2 LPSS Responsibility and Ownership

For private or Public Works LPSS projects, it is the intent of the City of New Albany that all LPSS construction within the limits of the right-of-way be completed as part of the same project to be considered substantially complete. This includes the Private Service Connection (PSC) from the main line pressure pipe to the Uni-Lateral valve assembly at the right-of-way line. This is to avoid future damage to pavement or other improvements in the right-of-way from future service line connections to the main line LPSS pipe.

Property owners (or developers) will be responsible after the City's acceptance of the LPSS for acquiring and installing the service lateral from the Uni-Lateral valve assembly, the grinder pump station, connecting their private sanitary line to the station, and, if applicable, properly abandoning their existing on-site treatment system.

Following substantial completion of the LPSS, the City of New Albany will own and be responsible for operation and maintenance of the following, notwithstanding any responsibilities required by applicable warranties:

A. Main line LPSS sanitary pressure pipe within rights-of-way or easements.

B. Main line appurtenances such as air valve structures and clean outs/flushing connections.

Following substantial completion of the LPSS, the property owner receiving sanitary sewer service will own and be responsible for operation and maintenance of the following, notwithstanding any responsibilities required by applicable warranties:

A. The PSC from the main line LPSS sanitary pressure pipe within rights-of-way or easements.

B. The Uni-Lateral stainless steel curb stop/check valve assembly located at or near the right-of-way line where it meets their own property line.

C. The pressure and gravity service laterals located on their own property.

D. The grinder pump station and all associated panels.

16.3 GENERAL LOCATION CRITERIA

Since it is a pressurized system there is significant flexibility for LPSS horizontal and vertical location to determine the most cost-effective and environmentally sensitive alignment that best serves the needs of the entire tributary area. Additionally, it is imperative that all alternatives worthy of consideration receive maximum and equal consideration regarding environmental impact. The costs and acquisition time for easements can be significant; therefore, LPSS should be located within existing easements and rights-of-way whenever feasible and practical.

When selecting the LPSS alignment, consideration should be given to the following general location criteria:

A. For protection of environmentally sensitive areas and constraints such as creeks, wetlands, trees, protected habitats, etc.

B. Existing utilities, railroads, highways, and overhead facilities.

C. Location of other existing and proposed sewerage and stormwater facilities.

D. Property values, easement needs and potential damage to the affected properties.

E. Existing and proposed high water elevations, including high water for appropriate design periods.

F. Anticipated extension of existing streets and the potential for the development of contiguous areas.

G. Continuity with adjacent design segments.

H. Maintenance of traffic.

I. Availability of materials.

J. Foundation conditions.

K. Construction cost.

The location of proposed LPSS should also comply with applicable portions of Indiana Administrative Code 327 IAC 3 Rule 6 “Technical Standards for Sanitary Collection Systems”.

16.4 HORIZONTAL ALIGNMENT CRITERIA

16.4.1 General

Installation of LPSS using Horizontal Directional Drilling (HDD) is preferred to limit surface disruption. Even so, consideration regarding horizontal alignment should be given to impacts from open-cut excavations at pit locations and potential future repairs and service connections.

LPSS shall be located in non-paved areas in existing easements or rights-of-way, or within a sanitary easement adjacent to the road right-of-way and shall be at least 10 feet from the water main. Air relief valve manholes shall be completely outside the pavement and not partially in the pavement, unless approved by the Sewer Board. The centerline of the manhole shall be a minimum distance of 3 feet from the edge of pavement, and a minimum distance of 5 feet inside sanitary easement.

16.4.2 LPSS Located under Pavement (Subject to Approval by Sewer Board)

Construction of LPSS under pavement will be subject to approval by the Sewer Board. If circumstances require the LPSS to be located under the roadway, the pipe shall be located in the traffic lane on the opposite side of the street and at least 10 feet away from the water main with the centerline of the LPSS to be a minimum of 5 feet from the edge of pavement. Every effort shall be made to place the entire air relief valve manhole frame and cover entirely within the pavement. In areas where this location will conflict with gas and water valves or other utilities, the LPSS location shall be adjusted to avoid these conflicts. Consideration of other factors, such as the width of the pavement, depth of rock, and possible conflict with other utilities, will still be required so the LPSS can be built without modification during construction.

In areas where concrete pavement is encountered, consideration shall be given to placing the LPSS in a location whereby one edge of the pavement to be removed would coincide with existing construction joints, which are generally in the centerline of the streets. This procedure would require that only one side of the pavement would have to be sawed for removal. In areas where lots slope abruptly away from the street, consideration shall be given to locating the LPSS near the property line on the low side.

16.4.3 Stationing

All LPSS stations shall increase upstream. Every effort shall be made to begin the stationing of an LPSS with Station 0+00.00 at the downstream end. When an existing sewer is to be extended, the stationing should be continued from the end of the existing sewer whenever possible. The PI stations and deflection angles or interior angles shall be shown on the plans at all changes in alignment.

16.4.4 LPSS Line Designations

The designation of the first LPSS in a collection system shall be LINE "A". The next LPSS upstream contributing to LINE "A" shall be designated LINE "B", and the station of LINE "B" at this point shall be Station 0+00.00. This method shall continue throughout the collection system and subsequent LPSS pipe runs shall be assigned appropriate designations by ascending letters. Lines beyond LINE "Z" shall continue with double letter designations starting with LINE "AA", "AB", etc.

16.5 VERTICAL ALIGNMENT CRITERIA

16.5.1 LPSS Depths

LPSS shall have a minimum cover of 4 feet in easements and a minimum cover of 5 feet in rights-of-way. Specific exceptions to these minimum requirements may be made with prior approval by New Albany.

Grinder Pump Station bottoms shall be set as needed for the station influent to receive the first-floor lateral invert by gravity. **Excessive Grinder Pump Station depths to receive basement sanitary facilities by gravity will not be allowed without prior approval by New Albany.**

In developed areas with on-site wastewater treatment receiving sanitary service via LPSS it is to be assumed that any existing sanitary facilities in basements are served by a private sump pump discharging up to the common lateral from the structure to the septic tank. **Excessive Grinder Pump Station depths to receive basement sanitary facilities by gravity will not be allowed without prior approval by New Albany.** The “Service Connection Survey” form, found on Exhibit 6-1, should be used to identify where basement facilities exist.

A minimum cover of 2 feet shall generally be maintained when crossing under existing streams, existing ditches, and existing or proposed channel improvements and storm sewers, provided the LPSS line is encased in concrete (or capped if approved by New Albany). With respect to open-cut installation across streams, restoration of the channel invert will conform to the applicable standard drawings (EC-01-01, EC-02-01, or EC-03-01) located in Appendix A.

16.5.2 LPSS Gradients

All LPSS gradients shall be referenced to the North American Vertical Datum of 1988. When connecting into or extending existing sewer facilities that were constructed using another datum, an elevation equation should be shown on the plans.

16.5.3 Flooding and Ponding Areas

Since the LPSS is a pressurized system the only open points in the system are at the Grinder Pump Stations. The tops of these stations should be kept a minimum of 2 feet above existing, proposed, or projected 100-year flood elevations whenever possible. If doing so would result in the top extending above the final grade around the station, then it shall be lowered so the top matches final grade and a watertight lid shall be used.

16.5.4 Minimum Water Main Clearances

The following minimum clearances between the LPSS and existing or proposed water mains shall be used in establishing the LPSS alignment:

16.5.4.1 Horizontal Clearance

The horizontal clearance shall be 10 feet minimum per the Indiana Administrative Code 327 IAC 3-6-9 "Separation of collection systems from water mains and drinking water wells." Where this is not possible, the Design Engineer should reference 327 IAC 3-6-9 for exceptions. Note that since the LPSS is a pressurized system it is considered similar to sanitary force main piping.

16.5.4.2 Vertical Clearance

The vertical clearance shall be at least 18 inches per the Indiana Administrative Code 327 IAC 3-6-9 "Separation of collection systems from water mains and drinking water wells." The LPSS pipe shall be located <u>below</u> the water main. Where this is not possible, the Design Engineer should reference 327 IAC 3-6-9 for exceptions. Note that since the LPSS is a pressurized system it is considered similar to sanitary force main piping.

16.6 GENERAL PROCEDURES

The general process for determining the design flow for LPSS segments shall be identical to what is required for gravity sanitary sewers in Section 12.6, General Procedures.

16.7 DRAINAGE MAP REQUIREMENTS

The process for preparing a Drainage Map for LPSS shall be identical to what is required for gravity sanitary sewers. Refer to Section 12.7, Drainage Map Criteria, to prepare the Drainage Map for the proposed LPSS service area.

16.8 DESIGN FLOW CRITERIA

The determination of design average and peak daily flow rates for LPSS is identical to that for gravity sanitary sewers. Refer to Section 12.8, Design Flow Criteria, to determine LPSS design flow rates.

16.9 LPSS HYDRAULIC DESIGN CRITERIA

16.9.1 General

LPSS design is to be based on established estimates to determine how many grinder pump stations within a system will simultaneously operate upstream of any given stretch of sewer pipe. This information is used to determine the pipe diameter that meets the velocity and TDH criteria.

The system should be designed to give the shortest runs and the fewest abrupt changes in direction. “Loops” in the system must be avoided as they lead to unpredictable and uneven distribution of flow.

16.9.2 Flow Characteristics

All LPSS main pipe shall be sized to carry the design flow for each segment at a velocity between 2.0 fps and 5.0 fps. Maximum Total Design Head (TDH) shall be 185 feet.

Design Pipe Roughness Coefficient (C) shall be 120 and 150 for HDPE.

Typical residential flow per grinder pump is assumed to be 11 gpm.

16.9.3 Air Valves

Air/vacuum valves, air release valves and combination air valves serve to prevent the concentration of air at high points within a system. This is accomplished by exhausting large quantities of air as the system is filled and also by releasing pockets of air as they accumulate while the system is in operation and under pressure. Air/vacuum valves and combination air valves also serve to prevent a potentially destructive vacuum from forming.

Air relief valves for LPSS should be installed at the beginning of each downward leg in the system that exhibits a 25-foot or more drop. Air will accumulate in downhill runs preceded by an uphill run. It is not generally required to provide air valves for LPSS at high points where there is less than a 25-foot drop as air suspended in the flow will typically be forced downstream in the smaller diameter pipes.

Long ascending or descending lines or long horizontal runs require air and vacuum or dual-function valves placed at approximately 2000-foot intervals.

16.9.4 Cleanout and Flushing Stations

Cleanout and flushing stations should be incorporated into the pipe layout. In general, cleanouts should be installed at the terminal end of each main, every 1,000 to 1,500 feet on straight runs of pipe, and whenever two or more mains come together and feed into another main

16.10 HYDRAULIC COMPUTATIONS

It is intended that all LPSS in the City of New Albany be designed to use the E/One grinder pump stations and appurtenances. Therefore, hydraulic computations are to be completed with E/One's Design Assistant Software, latest version. Alternatively, hydraulic analysis can be completed by E/One. These resources are available at:

www.eone.com/sewer-systems/design-center

Use of alternative computation methods may be submitted to the City along with full backup documentation and explanation for consideration as an equal.

16.11 LPSS PIPE

16.11.1 High Density Polyethylene (HDPE)

LPSS pipe shall be High Density Polyethylene (HDPE) suitable for installation using either Horizontal Direction Drilling (HDD) or open-cut methods.

Pipe shall comply with ASTM D 3035, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter for pipe diameters up to and including 3-inches, and ASTM F 714, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter for pipe sizes 4-inches and larger.

Materials used for the manufacture of HDPE pipe shall be extra high molecular weight, high density ethylene/hexane copolymer PE 4710 or PE 3608 polyethylene resin meeting the requirements of ASTM D 3350 with a minimum cell classification of PE445474C for PE 4710 and PE345464C for PE 3608 for products manufactured in accordance with ASTM D 3035. Pipe shall be minimum DR 11 sized in accordance with IPS.

All material shall have a hydrostatic design basis of 1,600 psi or more. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All material shall be listed by the Plastic Pipe Industry in the name of the pipe manufacturer and shall be based on ASTM D 2837 and PPI TR-4 testing and validation for samples of the pipe manufacturer's production pipe. Pipe shall have a co-extruded green cover or extruded green stripes designating it as a wastewater pipeline.

HDPE pipe shall be joined into continuous lengths on the job site above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. Electrofusion shall not be used except as needed to connect adjacent directionally drilled sections which are to be connected in the trench bottom. Mechanical joint adapters are required to mechanically connect the HDPE pipe to different pipe materials. Joint restraint to prevent axial separation shall be incorporated into the design of the sleeve or coupling used to connect HDPE pipe plain ends. Internal pipe wall stiffeners must be used when restraining HDPE. The restrained coupling system shall be Series 4800 manufactured by EBAA Iron, Inc. or an approved equal.

Fittings shall be the same HDPE material as the pipe. HDPE fittings shall be manufactured in accordance with ASTM D 3261 by injection molding, a combination of extrusion and machining, or fabricated from HPDE pipe conforming to this Specification. Fittings shall be fully pressure rated and provide a working pressure equal to the adjacent pipe with an included two to one safety factor. Joints between plain end pipes and fittings shall be made by butt fusion using procedures that are in accordance with ASTM F2620 by a person who is a manufacturer's certified thermojointer.

During the extrusion production, the HDPE pipe shall be continuously marked per ASTM and AWWA with durable printing with, at a minimum, the following: nominal pipe size, dimension ratio, pressure rating, trade name, material classification, certification bases, and date.

In addition to the holding, storage, and color requirements in these specifications, when moving fused sections of pipe, chains or cable type chokers shall be avoided, nylon slings are preferred. Care must be exercised to avoid cutting or gouging the pipe.

Pipe possessing the following defects may be rejected for installation: variation from straight centerline; elliptical shape; illegible markings as required herein; deep or excessive gouges or scratches of the pipe wall; fractures, punctures, or cracks passing through the pipe wall; damaged ends where such damage would prevent making a satisfactory joint.

16.11.2 Minimum Diameter

The minimum allowable nominal inside diameter for LPSS pipe, other than property service connections, shall be 1-1/2 inches. All property service connections shall have a minimum nominal inside diameter of 1-1/4 inches; commercial or industrial connections shall be individually considered with the minimum nominal size being 1-1/4 inches.

16.11.3 Tracer Wire

Tracer wires shall be installed along the LPSS main line and service line pipe, fastened securely to the pipe at five (5) foot intervals, and terminating above ground with the lead taped around each structure. The wire shall be brought up to the ground level every four hundred (400) feet through a vinyl coated aluminum riser pipe with cap and/or at all line valve boxes. The wires shall be connected using DBR Direct Burial Splice Kit manufactured by 3M Electrical Products Division, Austin, TX or approved equal. The riser pipe and cap shall not be placed in areas subject to vehicular traffic. The tracer wire shall be capable of, and demonstrated to have, continuous transmission of tracing signal along the full length of the installed pipe. Wire ends shall be accessible at structures and risers and secured so they are in a visible location that can be connected to without completing confined space entry.

If any appurtenant structure, such as an air release valve, is required as part of the low pressure sewer installation, the wire shall be cut with each end entering the structure under the casting frame.

Tracer wire shall be Copperhead Direct Burial #12 AWG Solid, steel core hard drawn extra high strength horizontal directional drill tracer wire, 1150# average tensile break load, 45 mil high molecular weight-high density green colored polyethylene jacket complying with ASTM D-1248, 30-volt rating or approved equal.

16.11.4 Hydrostatic Leakage Testing for LPSS

The hydrostatic leak test shall be done in accordance with AWWA standards based on the installed low pressure sewer material, in accordance with ASTM E 1003, and as follows:

A. The hydrostatic test may be done immediately after final backfill is placed and the air and/or vacuum release valves are installed.

B. All leakage testing must be performed in the presence of a representative of New Albany, and will provide a stopwatch, recording forms and calculations to demonstrate if the test passed or failed.

C. When conducting any leakage test, the Contractor shall provide all meters, weirs, gages, water, equipment and personnel necessary to perform the test as specified. At a minimum, the following shall be provided:

   1. Hydrostatic Test Pump (jockey pump).

   2. Continuous monitoring pressure gage having a range of 0 – 150 psi graduated in 1 psi increments. The gauge shall be no less than four (4) inches in diameter.

   3. Pipe plugs and/or caps. The plugs/caps shall be equipped with a minimum of two (2) openings for filling/draining the low pressure sewer and for bleeding air from the line.

   4. Calibrated/graduated container to measure the quantity of water required to be added during the hydrostatic test to maintain the test pressure.

D. The procedures for the hydrostatic test are as follows:

   1. Close isolation valves on the Uni-Lateral assembly. Redundant check valves on station laterals and anti-siphon/check valve assemblies on grinder pump cores should not be used as system isolation valves during line tests.
   2. After the low pressure sewer has been backfilled to final grade, securely plug and/or bulkhead the ends being tested. Thrust blocking restraints shall be

installed at each bulkhead in accordance with the bulkhead manufacturer's requirements.

3. All air and/or vacuum release valves shall be installed and in normal (open) in-service position during the test.

4. The low pressure sewer shall be slowly pressurized with water to 1.5 times the working pressure, or 100 psi, whichever is greater. Trapped air shall be expelled through high point bleed off valves as the low pressure sewer is being filled. When the pressure has been reached, the test pump shall be shut off. After the low pressure sewer has been pressurized, measure the pressure drop for two (2) hours.

5. If no pressure drop occurs within the two (2) hour test time, the low pressure sewer shall have passed the test.

6. If a pressure drop occurs within the two (2) hour test time, the low pressure sewer shall have failed the test. The Contractor shall repair or replace all defective materials or Workmanship and conduct additional leakage tests necessary to demonstrate that the repaired section meets the leakage requirements, at no additional cost to New Albany. If requested by New Albany the Contractor shall submit in writing a method of repair which must be approved by New Albany before repair can begin.

16.12 GRINDER PUMP STATION

16.12.1 General

Each unit shall be a complete factory-built and tested Wetwell/Drywell Grinder Pump Station consisting of grinder pump(s) suitably mounted in a basin constructed of high density polyethylene (HDPE) for simplex stations and HDPE or Fiberglass Reinforced Polyester Resin for duplex stations with dimensions and capacities as required in the Contract Drawings, NEMA 6P electrical quick disconnect (EQD), pump removal system, stainless steel discharge assembly/shut-off valve, and anti-siphon valve/check valve, each assembled in the basin, plus external electrical and alarm panel and all necessary internal wiring and controls.

Component type grinder pump systems that require field assembly will not be acceptable. For ease of serviceability, all pump, motor/grinder units shall be of like type and horsepower throughout the system, unless otherwise specified herein. Grinder pump stations, complete with all appurtenances, form an integral system, and as such, all stations shall be supplied by a single grinder pump station manufacturer.

All maintenance tasks for the grinder pump station shall be possible without entry into the grinder pump station, as per OSHA 1910.146 Permit-Required Confined Space.

The grinder pump station shall have a cartridge type, easily removable core assembly consisting of pump, motor, grinder, all motor controls, check valve, anti-siphon valve, level controls, electrical quick disconnect and wiring. The core unit shall be installed in the basin by the manufacturer. Field assembly of the pump and controls into the basin is not acceptable because of potential workmanship issues and increased installation time. The core unit shall seal to the tank deck with a stainless steel latch assembly. The latch assembly must be actuated utilizing a single quick release mechanism requiring no more than a half turn of a wrench. The watertight integrity of each core unit shall be established by a 100 percent factory test at a minimum of 5 PSIG.

The grinder pump core, including level sensor assembly, shall have two lifting hooks complete with lift-out harness connected to its top housing to facilitate easy core removal when necessary. The level sensor assembly must be easily removed from the pump assembly for service or replacement. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. Each EQD half must include a water-tight cover to protect the internal electrical pins while the EQD is unplugged. A pump push-to-run feature will be provided for field trouble shooting. The push-to-run feature must operate the pump even if the level sensor assembly has been removed from the pump assembly. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

The equipment specified herein shall be a product of a company experienced in the design and manufacture of grinder pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for its product, submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of grinder pump replacement parts. The manufacturer shall provide, upon request, a reference and contact list from ten of its largest contiguous grinder pump installations of the type of grinder pumps described within this specification.

Unless otherwise specified, all grinder pump stations shall be semi-positive displacement type Model DH071, as manufactured by Environment One.

16.12.1.1 Alternate Equipment

The City of New Albany may, at their sole discretion, consider an alternative grinder pump station and manufacturer for pre-approval as an equal.

If the contractor or another supplier proposes an alternate to the specified manufacturer, it is recognized that it will be difficult to conform to certain details of this Specification due to different manufacturing techniques or grinder pump station designs. If proposing an Alternate, the contractor (supplier) must submit (no less than 15 business days in advance of a bid date for Public Works projects) a complete description of any changes that will be necessary to the system design, a complete submittal package, a system hydraulic analysis based on the proposed pump (including pipe sizes, flows, velocities, retention times and number and location of recommended valves and cleanouts, if any), a list of exceptions to this specification, and demonstration of compliance to the experience requirements of this specification.

The contractor (supplier) must also complete a Manufacturer Disclosure Statement that will be provided. This information must be submitted for pre-approval of the alternate equipment being proposed and determination of compliance with these Contract Documents. If the equipment differs materially or differs from the dimensions given on the Drawings, the contractor (supplier) shall submit complete drawings showing elevations, dimensions, or any necessary changes to the Contract Documents for the proposed equipment and its installation. Pre-approval, if granted, will be provided in writing by the City to the contractor (supplier) (at least five business days in advance of the bid date for Public Works projects). If pre-approval is obtained for Alternate Equipment, the contractor (supplier) must make any needed changes in the structures, system design, piping or electrical systems necessary to accommodate the proposed equipment at the expense of the contractor (supplier).

All manufacturers proposing equipment for LPSS projects shall have at least 10 years of experience in the design and manufacture of units of identical size(s) and performance to the specified units. All manufacturers proposing equipment for LPSS projects must also have not less than 500 successful installations of low pressure sewer systems utilizing grinder pumps of like type to the grinder pumps specified herein. An installation is defined as a minimum of 25 pumps discharging into a common force main which forms a low pressure sewer system. The contractor (supplier) proposing alternate equipment shall also submit an installation list with contact person(s), phone number(s) and date(s) of at least 10 installations of the type of pump specified herein that have been in operation for at least 10 years

In lieu of the above experience clause, the contractor (supplier) of alternate equipment shall be required to submit a 5-year performance bond for 100 percent of the stipulated cost of the equipment. This performance bond will be used to guarantee the replacement of the equipment if it fails within the bond period.

16.12.2 Factory Test

Each grinder pump shall be submerged and operated for 1.5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge assembly and each unit's dedicated level controls and motor controls. All factory tests shall incorporate each of the above-listed items. Actual appurtenances and controls which will be installed in the field shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps is not acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two different points on its curve. Additional validation tests include: integral level control performance, continuity to ground and acoustic tests of the rotating components.

All completed stations shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.).

The City of New Albany reserves the right to inspect such testing procedures at the grinder pump station manufacturer's facility.

16.12.3 Warranty

Warranty certification shall be completed by the grinder station unit manufacturer. The grinder pump manufacturer shall provide a parts and labor warranty to the property owner on the complete station and accessories, including, but not limited to, panel and redundant check valve, for a period of twenty-four (24) months after property owner's acceptance, but no greater than twenty-seven (27) months after delivery of the complete station and accessories to the property owner. Any manufacturing defects found during the warranty period shall be reported to the manufacturer by the property owner and shall be corrected by the manufacturer at no cost to the property owner.

16.12.4 Grinder Pump

Each grinder pump shall produce 15 U.S. GPM at 0 feet TDH, 11 U.S. GPM at 92 feet TDH, and 7.8 U.S. GPM at 185 feet TDH. The pump must also be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal. Double radial O-ring seals are required at all casting joints to minimize corrosion and create a protective barrier. All pump castings shall be cast iron, fully epoxy coated to 8 – 10 mil nominal dry thickness, wet applied. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. Plating on the rotor is not acceptable. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. This material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service

The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired grinder pump station in its tank shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use. UL listing of components of the station or third-party testing to UL standard shall not be accepted.

The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the seal of NSF International. Third-party testing to NSF standard is not acceptable.

16.12.4.1 Grinder

The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller (cutter wheel) assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder impeller shall be a one-piece, 4140 cutter wheel of the rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50 – 60c for abrasion resistance. The shredder ring shall be of the stationary type and the material shall be white cast iron.

The teeth shall be ground into the material to achieve effective grinding. The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque.

The grinder assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump.

A. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.

B. The maximum flow rate through the cutting mechanism must not exceed 4 feet per second to minimize jamming.

C. The inlet shroud shall have a diameter of no less than 5 inches to prevent exceedance of the maximum flow rate through the cutting mechanism.

D. The impeller mechanism must rotate at a nominal speed of no greater than 1,800 rpm.

The grinder shall be capable of grinding all materials found in normal domestic sewage, including, but not limited to, plastics, rubber, sanitary napkins, and disposable diapers into a finely ground slurry that shall pass freely through the passages of the pumps and the 1¼” diameter discharge piping.

16.12.4.2 Motor

As a maximum, the motor shall be rated 1 HP, 120/240 volts, 1 phase, 60 hertz, 1,725 R.P.M. The motor shall be a capacitor start, ball bearing, air-cooled induction type with Class F insulation, low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. The motor shall be press-fit into the casting for better heat transfer and longer winding life. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. The motor protector shall be specifically investigated and listed by Underwriters Laboratories Inc. for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability.

The wet portion of the motor armature must be 300 Series stainless steel. To reduce the potential of environmental concerns, the expense of handling and disposing of oil, and the associated maintenance costs, oil-filled motors will not be accepted. Pump operation during instances of potentially damaging high current or low voltage conditions shall be inhibited by an in-pump electrical monitoring system that has been investigated and listed by Underwriters Laboratories Inc. for the application. Motor start shall be controlled by a DC driven electromechanical relay integrated within the control compartment of the pump. Electrical monitoring shall ensure the relay operates reliably. AC Mechanical contactors for motor start are susceptible to damage from short cycling and will not be accepted.

The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary silicon carbide seat and silicon carbide rotating surface with faces precision lapped and held in position by a stainless steel spring.

16.12.4.3 Electrical Power/Control Cord

Electric power/control cord shall be SOW/SOW-A water resistant 600 V, 60 degrees C, U.L. and C.S.A approved. The single cord shall incorporate both power and sensor leads and shall be a minimum of seven (7) conductors.

The motor cord-entry sealing assembly shall consist of the following components to ensure a positive, redundantly water tight seal:

A. Each individual lead shall be interrupted by a solid, uninsulated butt connector to prevent wicking of moisture through the conductor strands. The leads shall then be isolated by a nylon separator to prevent arcing and surrounded with a dielectric epoxy barrier for absolute liquid stoppage.

B. The cord moisture seal shall consist of a PVC jacket molded to the outside diameter of the cord which encapsulates the cord outside diameter and the outside diameter of the motor connection leads.

C. Sealing of the inside diameter of the motor housing entrance shall be accomplished by the mating of a chamfered pilot on the molded cord jacket with a taper machined in the entrance and secured by a threaded cord grip.

D. The sealing components shall be mechanically isolated from any strains by a two-piece cord grip which shall securely grip the molded cord jacket above the moisture-sealing components and bear any mechanical forces applied to the cord. Additionally, the cord grip shall provide redundant sealing of the molded cord jacket outside diameter.

The tank accessway shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The EQD will be supplied with 32’, 25’ of useable Electrical Supply Cable (ESC) outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer. Field assembly of the ESC into the basin is not acceptable because of potential workmanship issues. The EQD shall require no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. A junction box shall not be permitted in the accessway due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required.

16.12.5 Tank and Integral Accessway

The tank shall be a Wetwell/Drywell design made of high-density polyethylene, with a grade selected to provide the necessary environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. The corrugations of the outside wall are to be a minimum amplitude of 1-1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be 0.250" thick (minimum). All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure. The tank base shall be designed in a manner that does not require a concrete anti-flotation collar.

Backfill the tank to just below the final surface using Class I or Class II backfill material as defined in ASTM 2321. Flowable fill may also be used.

The minimum total tank storage capacity shall be 70 gallons for a simplex pump station. Larger tanks are an option to increase storage time during a power outage. Duplex pumping systems are also an option for higher flow properties. The tank capacities shall be as shown on the contract drawings.

The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe.

The Drywell accessway shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The accessway design and construction shall enable field adjustment of the station height in increments of 3" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

The station shall have all necessary penetrations factory sealed and tested. No field penetrations shall be acceptable.

The accessway shall include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.

16.12.6 Station Piping and Valves

All discharge piping shall be constructed of 304 stainless steel. The discharge shall terminate outside the accessway bulkhead with a stainless steel, 1-1/4" Female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 235 psi WOG; PVC ball valves or brass ball/gate will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 Series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure. The valve body shall be an injection molded part made of an engineered thermoplastic resin. The valve shall be rated for continuous operating pressure of 235 psi. Ball-type check valves are unacceptable due to their limited sealing capacity in slurry applications.

The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts will be made of 300 Series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from an engineered thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.

16.12.7 Controls

All necessary motor starting controls shall be located in the core unit secured by stainless steel fasteners. Locating the motor starting controls in a separate enclosure is not acceptable. The wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls

The level sensor housing must be sealed via a radial type seal; solvents or glues are not acceptable. The level sensing control housing must be integrally attached to pump assembly so that it may be removed from the station with the pump and in such a way as to minimize the potential for the accumulation of grease and debris accumulation, etc. The level sensing housing must be a high-impact copolymer. The use of PVC for the level sensing housing is not acceptable.

Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The air column shall be molded from a copolymer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be sealed radially with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be integral to the pump core assembly in a single, readily exchanged unit. Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump.

All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by a separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices and their tendency to malfunction because of incorrect wiring, tangling, grease buildup, and mechanical cord fatigue.

To ensure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank or into tank-mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching, and insect infestation. The grinder pump will be furnished with a 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a FACTORY INSTALLED NEMA 6P EQD half attached to it

16.12.8 Alarm Panel

Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The enclosure shall not exceed 10.5” W x 14” H x 7” D, or 12.5” W x 16” H x 7.5” D if certain options are included.

The alarm panel shall contain one 15-amp, double-pole circuit breaker for the pump core’s power circuit and one 15-amp single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

The alarm panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high level alarm capability. The alarm sequence is to be as follows when the pump and alarm breakers are on:

A. When liquid level in the sewage wet well rises above the alarm level, audible and visual alarms are activated, the contacts on the alarm pressure switch activate, and the redundant pump starting system is energized.

B. The audible alarm may be silenced by means of the externally mounted, push-to-silence button.

C. Visual alarm remains illuminated until the sewage level in the wet well drops below the “off” setting of the alarm pressure switch.

The visual alarm lamp shall be inside a red, oblong lens at least 3. 75” L x 2.38” W x 1.5” H. Visual alarm shall be mounted atop the enclosure in such a manner as to maintain the NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

The entire Alarm Panel shall be listed by Underwriters Laboratories, Inc. or approved equal.

The alarm panel shall include a 20 amp, 250 VAC generator receptacle with a spring-loaded, gasketed cover suitably mounted to provide access for connection of an external generator while maintaining a NEMA 4X rating. An automatic transfer switch shall be provided, which automatically switches from AC power to generator power. Power shall be provided to the alarm panel through the generator receptacle whenever power is present at the receptacle, allowing the audible and visual alarms to function normally in generator mode. When power is no longer applied to the generator receptacle, the panel shall be automatically switched back to the AC Mains power.

16.13 PROPERTY SERVICE CONNECTIONS

16.13.1 General

The property service connection (PSC) is the section of pipe between the R/W or easement line and the mainline sewer. The standard connection for single-family residences will be 1-1/4 inch HDPE; commercial or industrial connections shall be individually considered with the minimum size being 1-1/4 inch HDPE.

All PSC shall be installed with tracer wire as specified for the main line sewer, whether the PSC is installed via HDD or open-cut. Install green metallic “locater” tape labeled “SEWER” above the PSC at a depth of not more than 30 inches when installation is via open-cut.

The location of the PSC shall be approved by the New Albany inspector. See the standard detail SP-01-01 Property Service Connection.

The depth of the property service connection at the R/W line will conform to Exhibit 12-6 and shall be at least 3’ deep.

The house connection line shall not be laid parallel to or within three feet of any bearing wall.

16.13.2 Uni-Lateral Valve Assembly

Each PSC shall require a redundant stainless-steel curb stop/check valve assembly along the 1-1/4 inch service lateral between the grinder pump station and the LPSS main or gravity sanitary sewer main. This assembly is to be located at or near the right-of-way line where it meets the property line of the property owner. The curb stop shall be pressure-tight in both directions. The ball valve actuator shall include position stop features at the fully opened and closed positions. The curb stop/check valve assembly shall be designed to withstand a working pressure of 235 psi.

The stainless-steel check valve shall be integral with the curb stop valve. The check valve will provide a full-ported 1-1/4” passageway and shall introduce minimal friction loss at maximum rated flow. The flapper hinge design shall provide a maximum degree of freedom and ensure seating at low back pressure.

The stainless steel, combination curb stop/check valve assembly shall be provided by the grinder station manufacturer that the LPSS design is based around. The same manufacturer shall warrant the assembly to be free from defects in materials and factory workmanship for two (2) years from date of installation, or twenty-seven (27) months from date of shipment. Each individual assembly shall be hydrostatically tested to 150 psi in the factory.

All pipe connections shall be made using compression fitting connections including a Buna-N O-ring for sealing to the outside diameter of the pipe. A split-collet locking device shall be integrated into all pipe connection fittings to securely restrain the pipe from hydraulic pressure and external loading caused by shifting and settling.

Curb boxes shall be constructed of ABS, conforming to ASTM-D 1788. Lid top casting shall be cast iron, conforming to ASTM A-48 Class 25, providing magnetic detectability, and be painted black. All components shall be inherently corrosion-resistant to ensure durability in the ground. Curb boxes shall provide height adjustment downward (shorter) from their nominal height.

16.13.3 Cleanouts

Each PSC must have a Two-Way Cleanout suitable for pressure pipe and installed just inside the R/W or easement line upstream of the Uni-Lateral Valve Assembly. A one-way cleanout shall also be installed within ten feet of the exterior wall and shall be installed to open in the direction of the flow. If a grease interceptor is installed outside the building, then a cleanout shall be installed in both sewer lines that exit the building.

Cleanout locations shall be approved by the New Albany inspector. Cleanouts shall be a minimum of 6 inches. See standard details SC-01-02 One Way Cleanout and SC-02-02 Two Way Cleanout.

16.14 LPSS MAIN LINE AIR VALVES

Recommendations for air valve type, location, and model shall be provided by the LPSS designer in coordination with the grinder pump station and air valve suppliers. Air valves for LPSS shall be suitable for use in small diameter pressure sewer applications. The manufacturer shall be the same as referenced in Appendix C, New Albany Technical Specifications for Lift Stations or a pre-approved equal if more suitable for LPSS application.

16.15 MANHOLES

Manholes are not typically required for LPSS since all elements of the system are pressurized. Some LPSS may require air relief and/or combination air valves, depending on the topography, and these are to be accessible for maintenance via 60” diameter precast concrete manholes. The overall requirements for these are identical to manholes for gravity sanitary sewers. Refer to Section 12.12, Manholes, for applicable requirements.

Cleanouts and flushing connections for LPSS can be brought to the surface for connection of flushing equipment without the need for standard precast manholes.

16.16 CONCRETE ENCASEMENTS

Requirements for concrete encasement of LPSS pipe is similar to that of gravity sewers. Refer to Section 12.17, Concrete Encasements for applicable requirements.

16.17 HORIZONTAL DIRECTIONAL DRILLING (HDD)

16.17.1 General

Trenchless installation of LPSS using Horizontal Directional Drilling (HDD) is the preferred method to limit surface disruption. When open-cut installation of LPSS pipe is utilized for main line piping, PSC, HDD pits, or any other excavation, the requirements related to pipe bedding and encasement for flexible gravity sewer pipe and trench backfill shall apply. Refer to applicable portions of Section 12.11, Sewer Pipe.

The contractor will have the option to offer a different method of trenchless pipe installation, subject to approval and acceptance by New Albany. When an alternate method is proposed by the Contractor they will be responsible for the final design calculations. A plan of operation and list of proposed materials will be submitted for New Albany approval. Structural calculations will be required for all components. Items may include: casing and carrier pipe, tunnel liner plates, working pits, sheeting and shoring, electrical facilities, ventilation, and communications. All design calculations and plans must be signed and sealed and submitted by a professional engineer licensed in the State of Indiana. The contractor will also need to coordinate their excavations beforehand with Indiana 811 - Call Before you Dig.

16.17.2 Surface and Subsurface Conditions

The Contractor shall verify the location of all known and unknown utilities and structures by test pitting prior to any boring or drilling. These utilities and structures may include, but are not limited to:

A. Underground utilities such as, but not limited to, storm drains; electric cables; water mains; sewer lines and septic systems; gas, telephone, fiber optic and cable television lines; wells; field drain tiles.

B. Above-ground utilities and other obstructions such as, but not limited to, electric and telephone poles, buildings, trees, and existing road signs.

Contractor is responsible for inspecting the site, for conducting investigations, surveys and tests, including subsurface investigations and tests, that Contractor determines are necessary for the complete execution of all the work.

16.17.3 Equipment

The directional drilling system to be used shall have the following features:

A. The system shall be remotely steerable and permit electronic monitoring of tunnel depth and location. The system shall be able to control the depth and direction of the pipe and must be accurate to a window of ±2 inches.

B. The system shall utilize a fluid-cutting process, using a liquid clay such as bentonite. This clay shall be totally inert and contain no risk to the environment.

C. The liquid clay shall remain in the tunnel to increase the stability of the tunnel and to provide a lubricant to reduce frictional drag when the pipe is installed.

D. The spoils shall be recovered by use of a vacuum system mounted on a vehicle for removal of the spoils. Spoils shall not be discharged into sewers or storm drains. Contractor is responsible for disposal of all spoil material.

16.17.4 Experience and Safety

Prior to commencing any work, Contractor shall demonstrate experience and expertise in trenchless excavation methods by providing a list of six (6) references for which similar work has been performed. These references shall include a name and telephone number for contact so the claims may be verified.

Contractor shall also provide documentation showing successful completion of at least 50,000 linear feet of directional drilling or shall obtain the services of an experienced directional drilling subcontractor meeting the experience requirements of this Section to supervise the installation prior to commencing any work. Conventional trenching shall not be considered as applicable experience.

All supervisory personnel shall be adequately trained and shall have at least four (4) years of experience in directional drilling. Prior to commencing any work, Contractor shall also submit the names and resumes of all supervisory field personnel for review.

Mechanical, pneumatic or water-jetting methods shall not be acceptable due to the risk of surface subsidence and damage.

Upon completion of drilling and pipe installation, Contractor shall remove all spoils from all starting and termination pits and shall restore the surface to its original condition.

Where junctions, manholes or grinder pumps are to be installed, adequate protection in the form of steel plates in traffic areas and timber shutters in other areas shall be used until such times as the manhole or grinder pump is installed and the pit is backfilled and stabilized. Contractor shall be responsible for maintaining these areas.

Because directional drilling may be performed while existing buried electrical cables are energized; the following safety requirements shall be met:

A. All drilling equipment must have a permanent, inherent alarm system capable of detecting an electrical current. The ground system shall be equipped with an audible alarm to warn the operator when the drill head nears electrified cable within a safe operating distance.

B. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors, hot boots and gloves.

C. All supervisor personnel shall be adequately trained and have direct supervisory experience in directional drilling.

16.17.5 Drilling Procedure

Prior to any alterations to the work site, Contractor shall complete preconstruction audio-video documentation for the entire work area, including HDD entry and exit points. One copy of the recording shall be given to the City's representative and one copy shall remain with Contractor for a period of one year following the completion of the project.

The work site as indicated on the Contract Drawings shall be graded or filled to provide a level working area. No alterations beyond what is required for operations shall be made. Contractor shall confine all activities to the designated work areas and construction limits.

The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on the Contract Drawings. If Contractor is using a magnetic guidance system, the drill path will be surveyed for any surface geo-magnetic variations or anomalies.

Environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place as needed, including berms, liners, turbidity curtains and other erosion control measures. Contractor shall adhere to all applicable environmental regulations. Fuel and oil must not be stored in bulk containers within 200 feet of any water-body or wetland.

Pipe resting on paved or hardened surfaces (i.e., sidewalks, asphalt, concrete, gravel, etc.) shall be placed on pipe rollers before being pulled into the drill hole with rollers spaced close enough to prevent excessive sagging and dragging of the pipe upon rough surfaces which could scar the pipe.

Contractor shall calibrate the directional drilling head locator at the start of the day and at each new directional drilling operation. A daily calibration log shall be kept for review.

The directional drilling operator shall have full control of the direction of the drilling tool at all times. Shallow, misdirected or other unsuccessful drill attempts shall be abandoned and filled at the direction of the City's representative and at no additional cost to the City.

The maximum drill angle shall be fifteen degrees measured perpendicular to grade to the design depth elevation.

A pilot hole shall be drilled on the drill path with no deviations greater than 5% of depth over a length of 100 feet. In the event that the pilot hole does deviate from the drill path more than 5% of depth in 100 feet, Contractor shall notify the City's representative, who may require Contractor to pull back and re-drill from the location along the drill path before the deviation at no additional cost to the City.

In the event of a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel viscometer and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor shall cease operations and notify the City's representative. The City's representative and the Contractor will discuss additional options and work will then proceed accordingly.

Upon successful completion of the pilot hole, Contractor will ream the drill hole to a minimum of 25% greater than the outside diameter of the installed pipe using the appropriate tools. In no case shall the size of the reaming operations result in a hole size greater than 150% of the outside diameter of the installed pipe. Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

After successfully reaming the drill hole to the required diameter, Contractor shall pull the pipe through the drill hole. In front of the pipe will be a swiveling mandrel. Once pull-back operations have commenced, operations must continue without interruption until the pipe is completely pulled into the drill hole. During pull-back operations Contractor shall not apply more than the maximum safe pipe pull pressure at any time.

Two strands of tracer wire shall be pulled back with the pipe. The wires shall be installed along the pipe, fastened securely to the pipe at five (5) foot intervals, and terminating above ground with the lead taped around each structure. The wire shall be brought up to the ground level every four hundred (400) feet through a vinyl coated aluminum riser pipe with cap and/or at all line valve boxes. The wires shall be connected using DBR Direct Burial Splice Kit manufactured by 3M Electrical Products Division, Austin, TX or approved equal. The riser pipe and cap shall not be placed in areas subject to vehicular traffic. The tracer wire shall be capable of, and demonstrated to have, continuous transmission of tracing signal along the full length of the installed pipe.

In the event the pipe becomes stuck during pull-back, Contractor shall cease pulling operations to allow any potential hydro-lock to subside prior to re-commencing pulling operations. If the pipe remains stuck, Contractor shall notify the City's representative. Contractor shall discuss options with the City's representative and then work will proceed accordingly.

At all drill pits and directional drilling entrances and exits to the surface, a backhoe or equivalent shall be used to gradually return the bore depth to the prescribed depth. All drill pits and directional drilling entrances and exits to the surface shall be backfilled and compacted as specified elsewhere in these Standards, depending on the final surface restoration.

Test/pressure relief holes (potholes) may be dug at the Contractor's discretion along the bore route to confirm alignment and grade, and to relieve subsurface pressure. The Contractor is fully responsible for ensuring installation along the correct alignment and grade and to comply with all other drilling operation logging and installation verification requirements.

Contractor shall provide completed forms or computer-generated output to the City's representative on a daily basis for checking line and grade of the drilling operation.

16.17.6 Testing and Inspection

After the pipe has been installed, allow pipe manufacturer's recommended amount of time, but not less than four (4) hours, for cooling and relaxation due to tensile stressing prior to hydrostatic testing.

The pipe is to be hydrostatically tested for leaks after complete installation of the entire LPSS. To identify any defects during installation, the pipe shall be hydrostatically tested after joining into continuous pullback sections following installation. Hydrostatic testing shall be in accordance with Section 16.11, LPSS Pipe

A horizontal tolerance of up to three (3) feet left or right of the planned alignment will be permitted at any point on the alignment provided the pipeline is still within the easement or right-of-way where it was planned.

Tolerances for vertical alignment compared to planned alignment will be judged on a case-by-case basis depending on the location relative to surrounding utilities, creation of new high or low points, required relocation of air/vacuum valves, and the effect on the pumping system curves.

Sections of pipe that do not meet the requirements shall be replaced by Contractor at no additional cost to the City. The rejected pipe shall be grouted and abandoned in place or removed and all voids filled as directed by the City's representative, at no additional cost to the City.

16.18 RAILROAD CROSSINGS

The criteria for LPSS railroad crossings are similar to those for gravity sanitary sewers. Refer to Section 12.19, Railroad Crossings for requirements.

16.19 HIGHWAY CROSSINGS

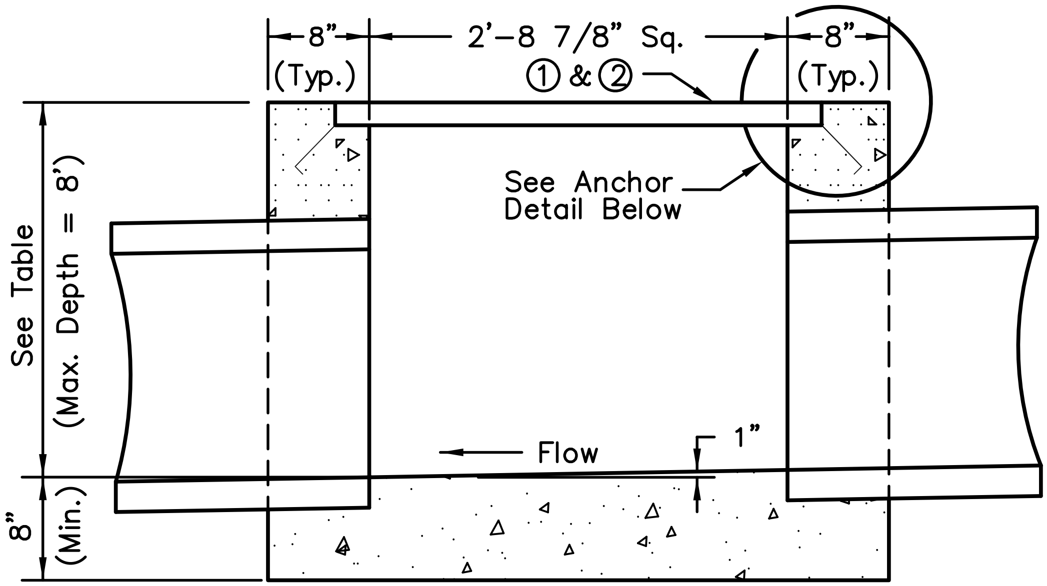
Criteria for LPSS pipe installations constructed under State, County, or City maintained roadways are similar to those for gravity sanitary sewers. Refer to Section 12.20, Highway Crossing for requirements.

16.20 CREEK, STREAM OR DITCH CROSSINGS

Criteria for LPSS pipes crossing a creek, stream or ditch are similar to those for gravity sanitary sewers. Refer to Section 12.21, Creek, Stream or Ditch Crossings.

Appendix A

Standard Details

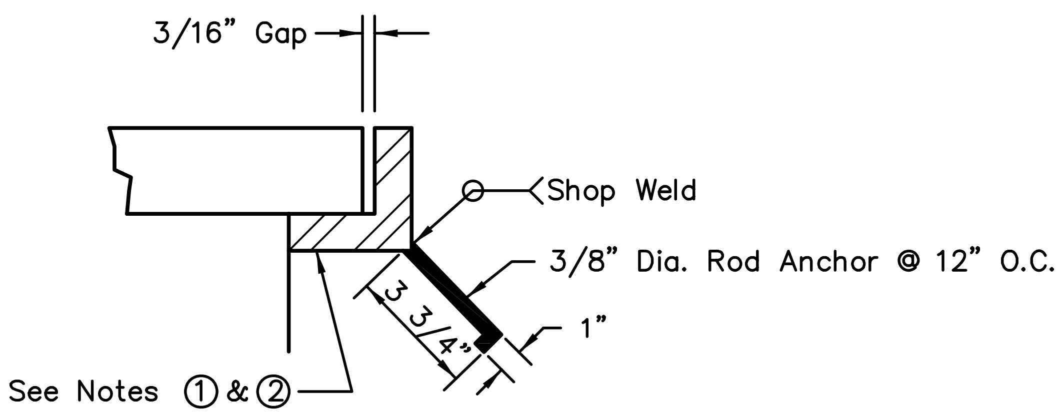


TYPICAL SECTION

NOTES

1. J.R. Hoe & Sons Model Hoe-595 grates with 2-1/2" x 2-1/2" x 1/2" angle iron frame or approved equal.
2. Neenah R-4884-A with L 2" x 2" x 1/4" angle iron frame or approved equal. (outside right-of-way only)
3. All concrete shall be Class "A".
4. Designed for a minimum of HS-20 loading.
5. Depth greater than 4'-0" require #4, GR. 60, reinforcing bars on 12" centers each way in both walls and base.

TABLE	
PIPE SIZE	MIN. DEPTH
12"	1'-9"
15"	2'-1"
18"	2'-4"
24"	2'-10"



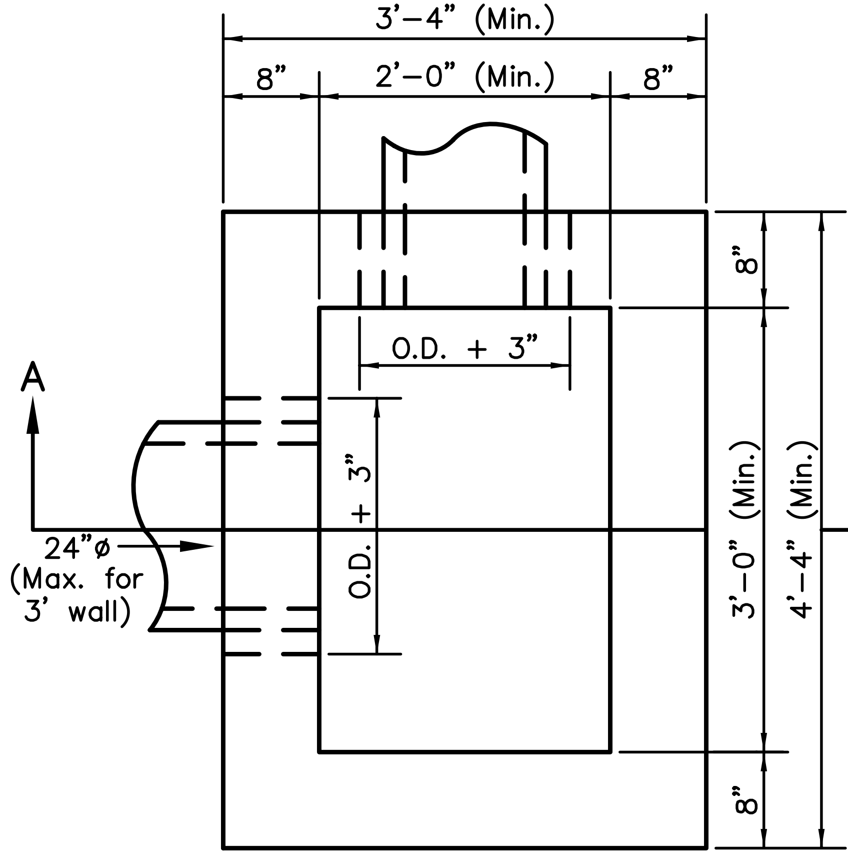
ANCHOR DETAIL

CATCH BASIN TYPE 1

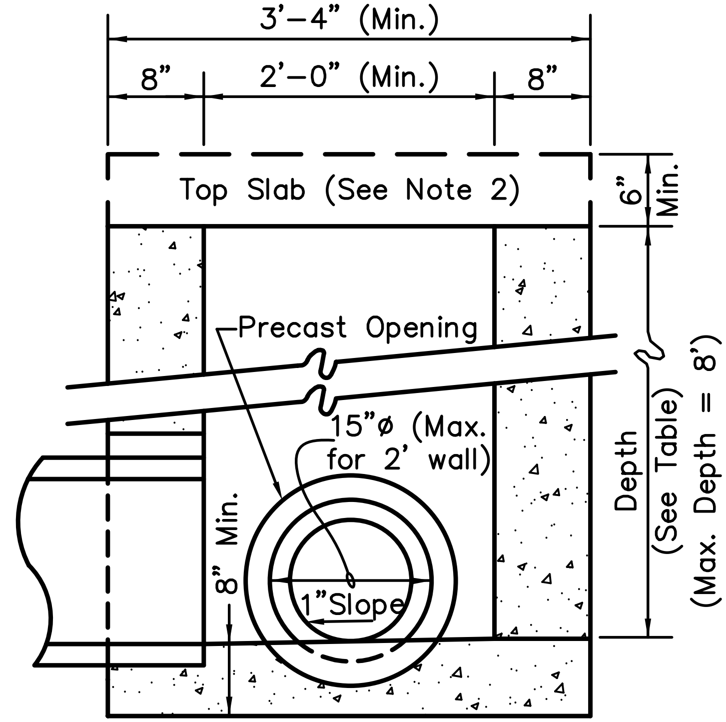
STANDARD DRAWING NO. DC-01-01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



PLAN



SECTION A-A

NOTES:

1. Concrete shall be Class "A".
2. Any catch basin exceeding interior dimensions of 2'x3' will require a concrete top slab of appropriately sized thickness and reinforced with an opening (2'x3') to receive frame and grate.
3. For precast basins the opening for the pipe shall be the outside diameter of the pipe plus 3 inches if non-shrink grout is used.
4. Size of basin needs to be checked if pipe is skewed.
5. Use DG-05 or DG-06 Frame and Grate as specifed.
6. Depths greater than 4'-0" require #4, Gr. 60 reinforcing bars on 12-inch centers each way in both walls and base.

TABLE

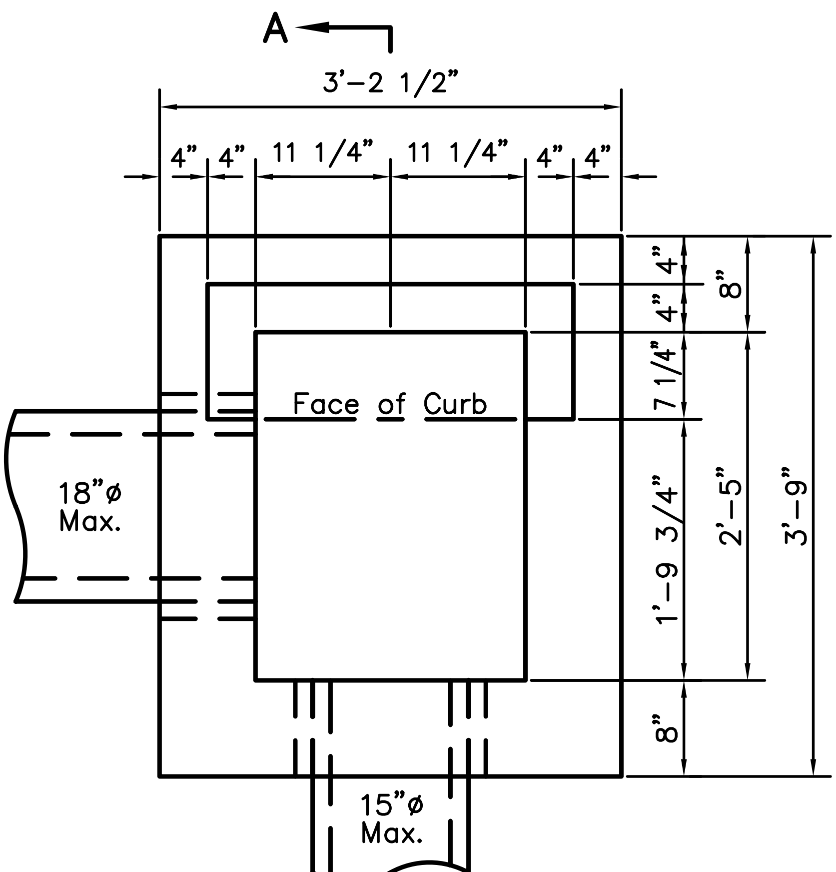
PIPE SIZE	MIN. DEPTH
12"	1'-8"
15"	1'-11"
18"	2'-2"
21"	2'-6"
24"	2'-9"
30"	3'-3"
36"	3'-10"

CATCH BASIN TYPE 2

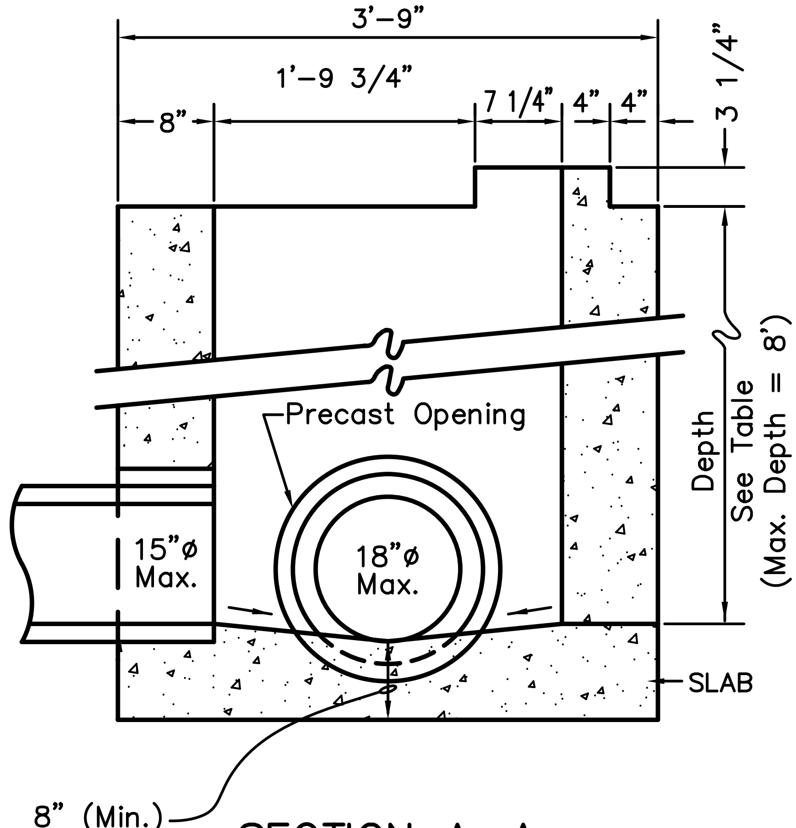
STANDARD DRAWING NO. DC-02-02

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



PLAN



SECTION A-A

NOTES:

1. Concrete shall be Class "A".
2. For precast basins the opening for the pipe shall be the outside diameter of the pipe plus 3 inches if non-shrink grout is used.
3. Size of basin needs to be checked if pipe is skewed.
4. Formerly City of Louisville single grate street inlet Type T-109.
5. Use Frame and Grate DG-01 or DG-02 as specified.
6. Depth greater than 4'-0" require #4, Gr. 60 reinforcing bars on 12 inch centers each way in both walls and base.

TABLE

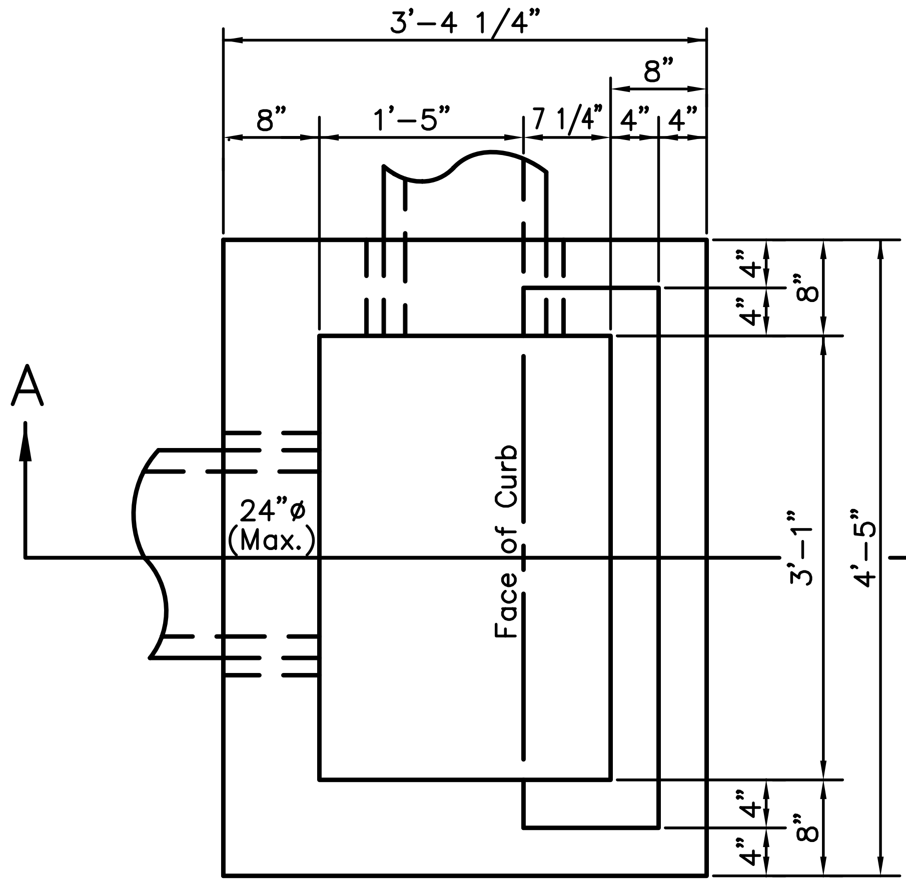
Pipe Size	Minimum Depth
12"	2'-2"
15"	2'-5"
18"	2'-8"

SINGLE CURB INLET

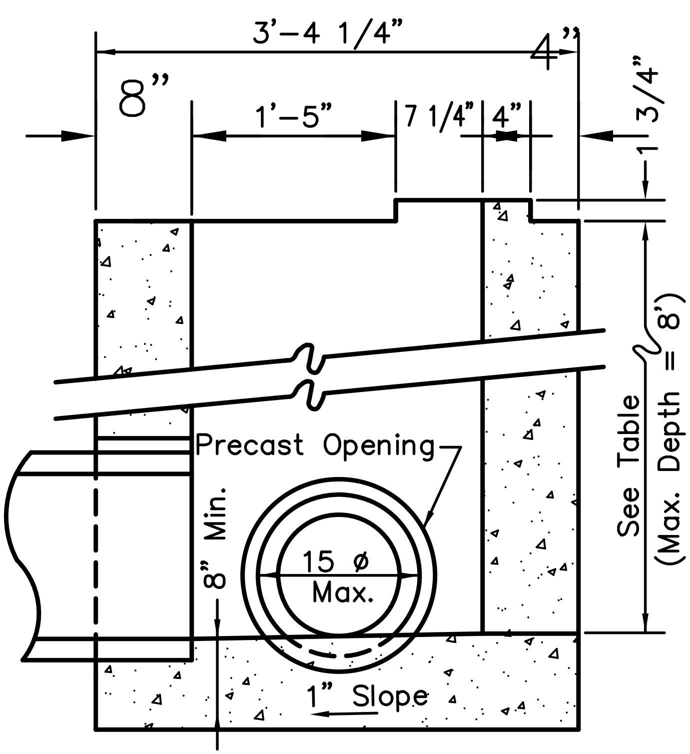
STANDARD DRAWING NO. DI-01-02

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



PLAN



SECTION A-A

NOTES:

1. Concrete shall be Class "A".
2. For precast basins the opening for the pipe shall be the outside diameter of the pipe plus 3 inches if non-shrink grout is used.
3. Size of basin needs to be checked if pipe is skewed.
4. Formerly City of Louisville double grate street inlet Type T-109.
5. Use DG-03 or DG-04 Frame and Grate as speciifed.
6. Depths greater than 4'-0" require #4, Gr. 60 reinforcing bars on 12-inch centers each way in both walls and base.

TABLE

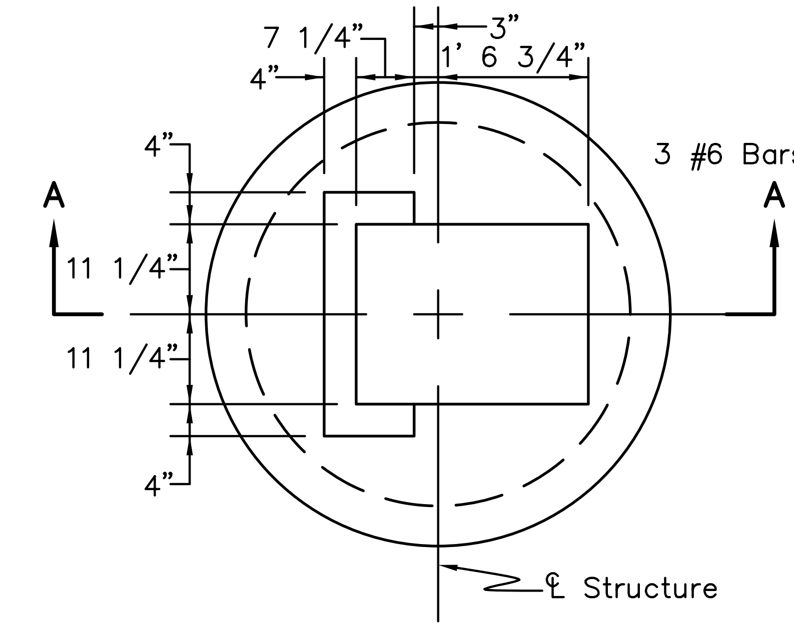
Pipe Size	Minimum Depth
12"	2'-2"
15"	2'-5"
18"	2'-8"
21"	3'-0"
24"	3'-3"

DOUBLE CURB INLET

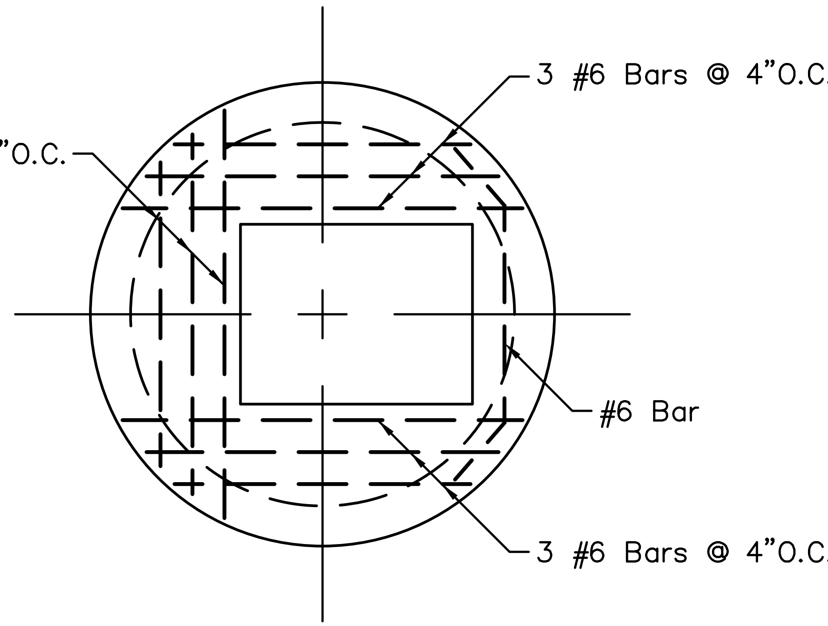
STANDARD DRAWING NO. DI-02-02

DECEMBER 2012

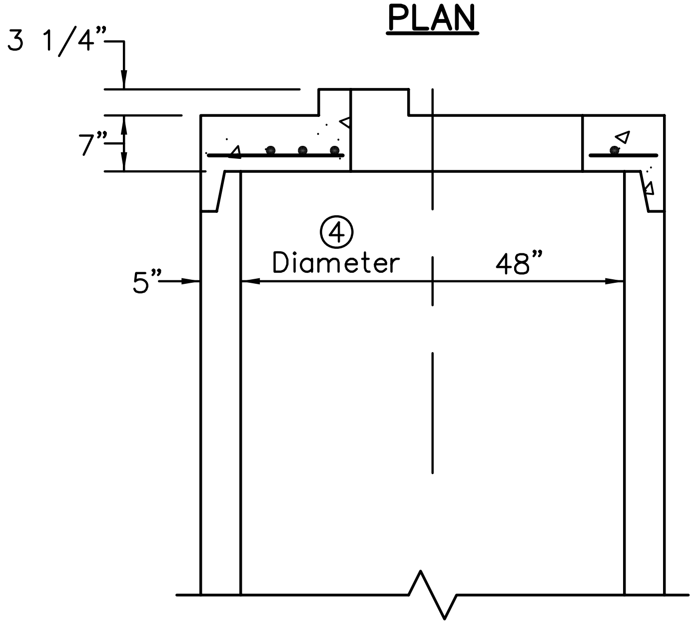
*This is a detail from MSD Standard Drawings dated 9-30-09.



PLAN



PLAN VIEW–REINFORCEMENT



SECTION A–A

NOTES

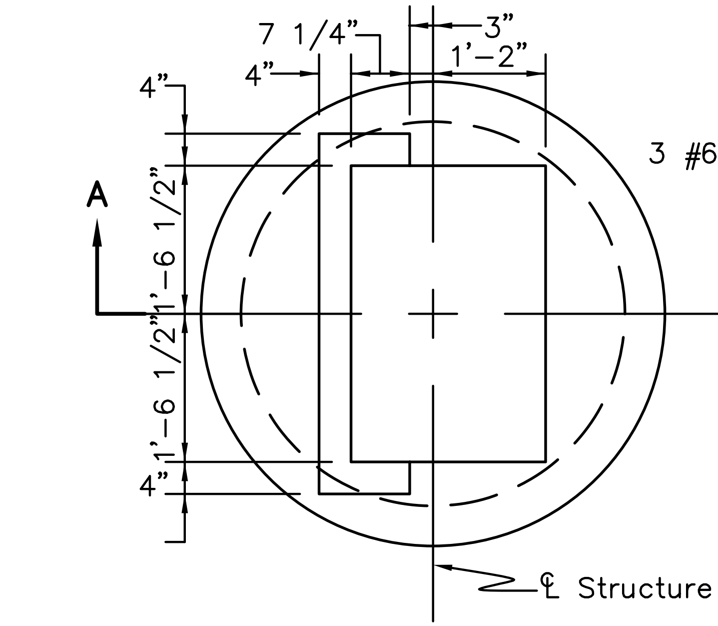
1. Concrete shall be Class "A".
2. Reinforcing steel shall be Grade 60.
3. For frame and arate see Std. Dwgs. DG-02.
4. For lower portion of structure see Std. Dwgs. GM–02 or GM–03.

PRECAST SURFACE INLET SLAB
FOR SINGLE FRAME & GRATE TYPE1

STANDARD DRAWING NO. DI–03–02

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



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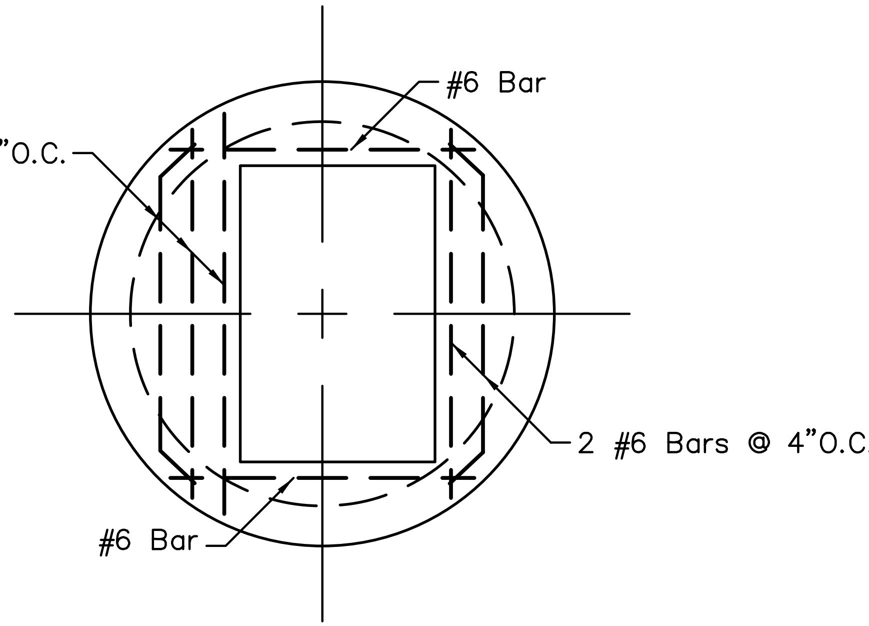
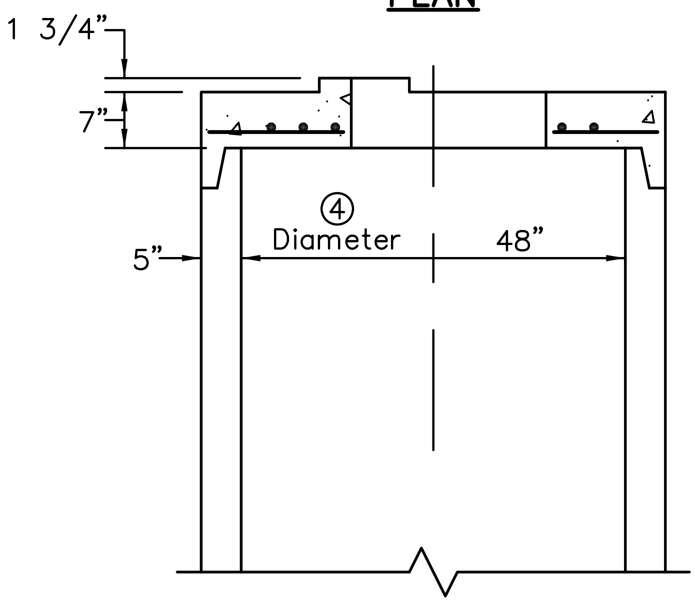


PLAN VIEW–REINFORCEMENT



SECTION A–A

NOTES

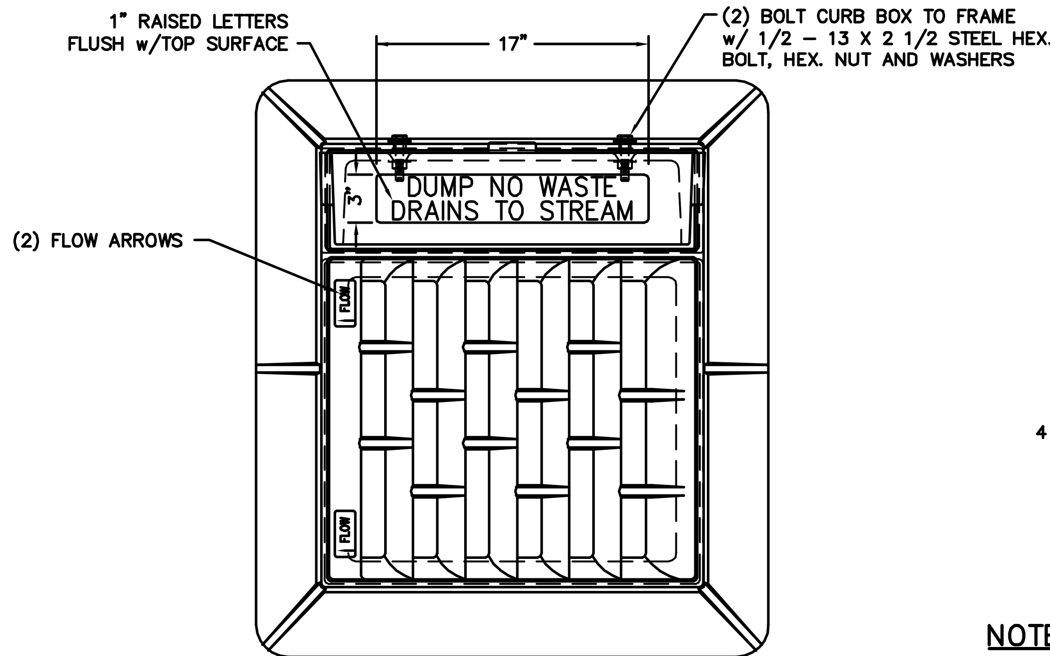
1. Concrete shall be Class "A".
2. Reinforcing steel shall be Grade 60.
3. For frame and arate see Std. Dwgs. DG-04.
4. For lower portion of structure see Std. Dwas. GM–02 or GM–03.
5. Design for HS-20 loading.

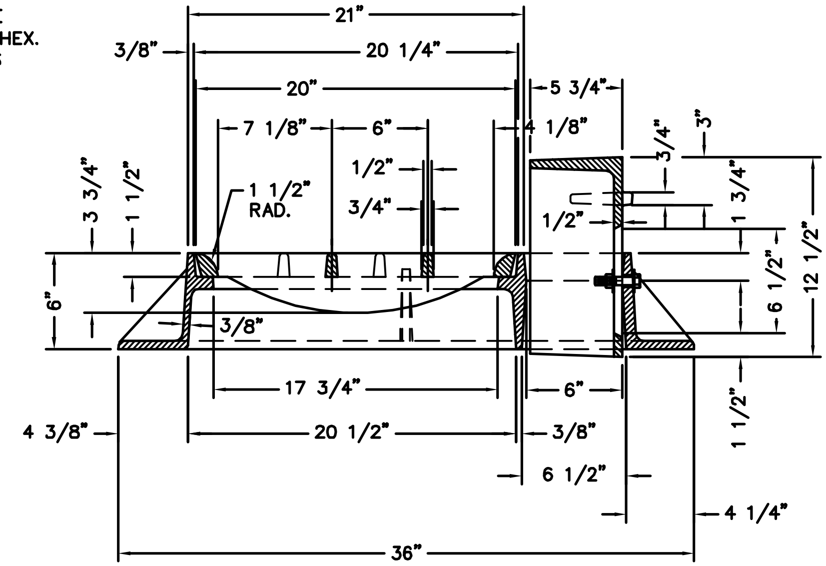
PRECAST SURFACE INLET SLAB
DOUBLE FRAME & GRATE TYPE 2

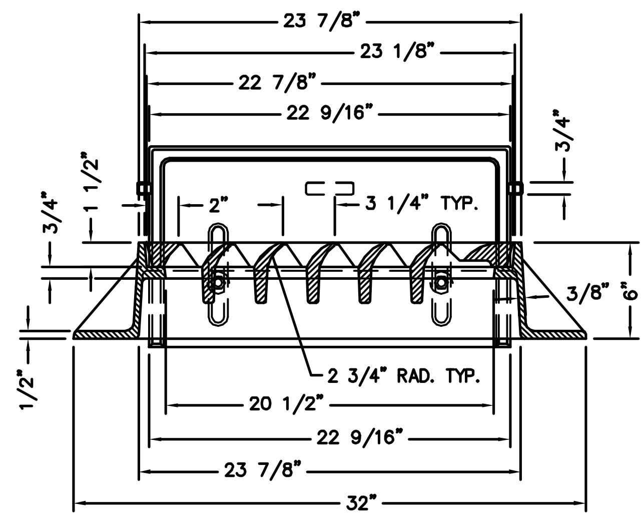
STANDARD DRAWING NO. DI–04–02

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.





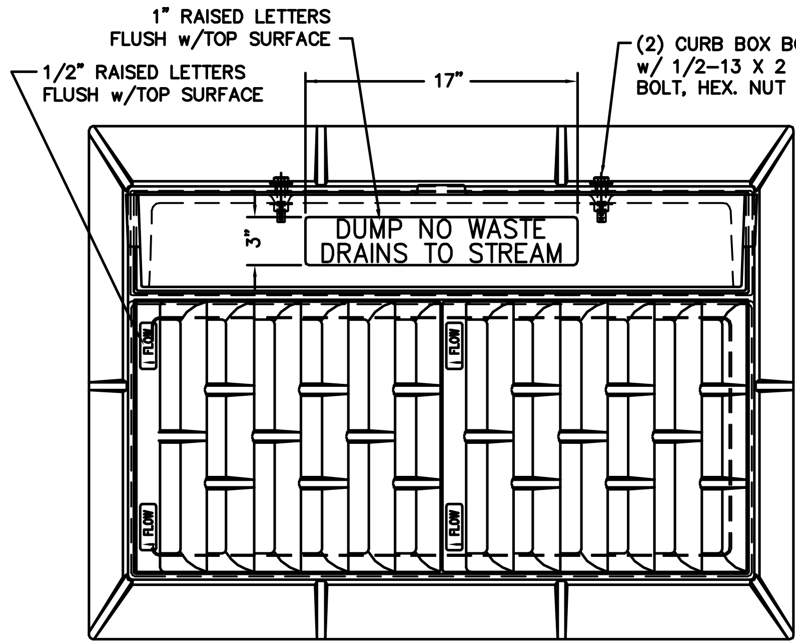


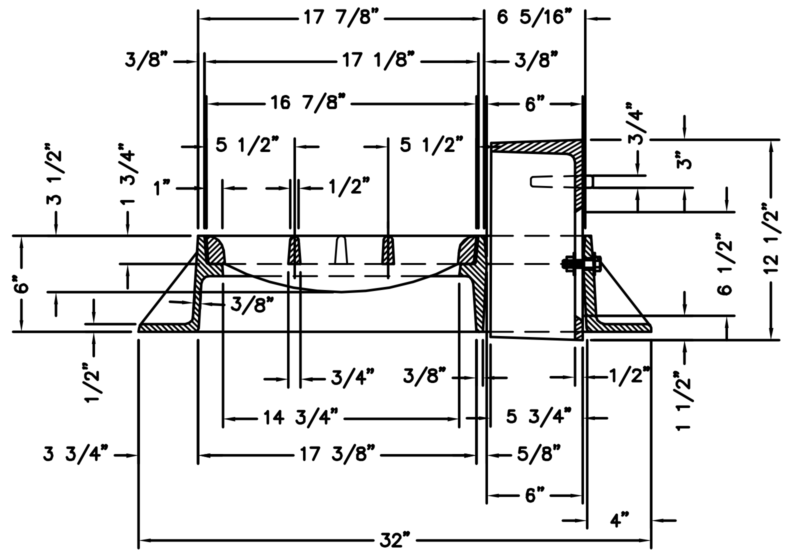
NOTES:

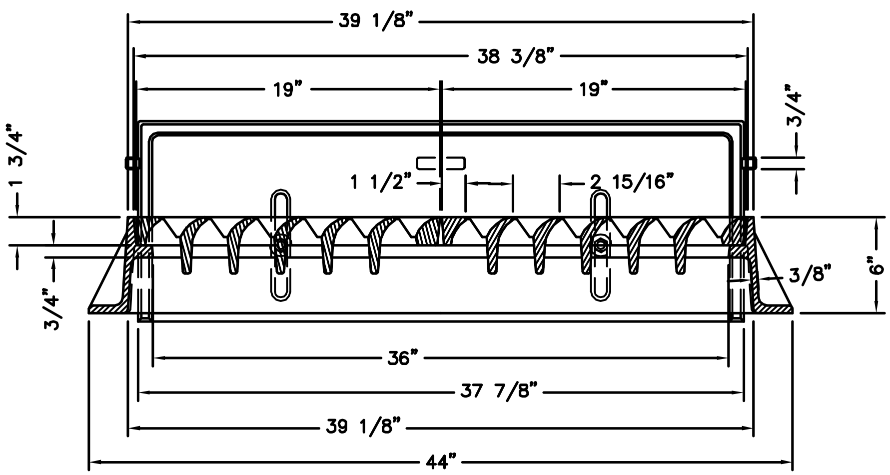
1. Material shall be Gray Iron and meet ASTM A–48 Class 35–B Standards.
2. Design for HS–20 Loading.
3. NEENAH R–3157–2 w/ SPECIAL 6" HIGH FRAME, TYPE "L" VANE GRATE, AND CURB BOX; or approved equal.
4. Curb iron must include either environmental message:
   (1) DUMP NO WASTE...DRAINS TO STREAM
   (2) NO DUMPING...DRAINS TO STREAM
5. Minimum Weights:
   Grate = 100lbs., Frame = 268lbs., Curb Iron = 75lbs

CURB CATCH BASIN – SINGLE FRAME AND GRATE TYPE 1–L	
STANDARD DRAWING NO.	DG–02–04
DECEMBER 2012	

*This is a detail from MSD Standard Drawings dated 9-30-09.





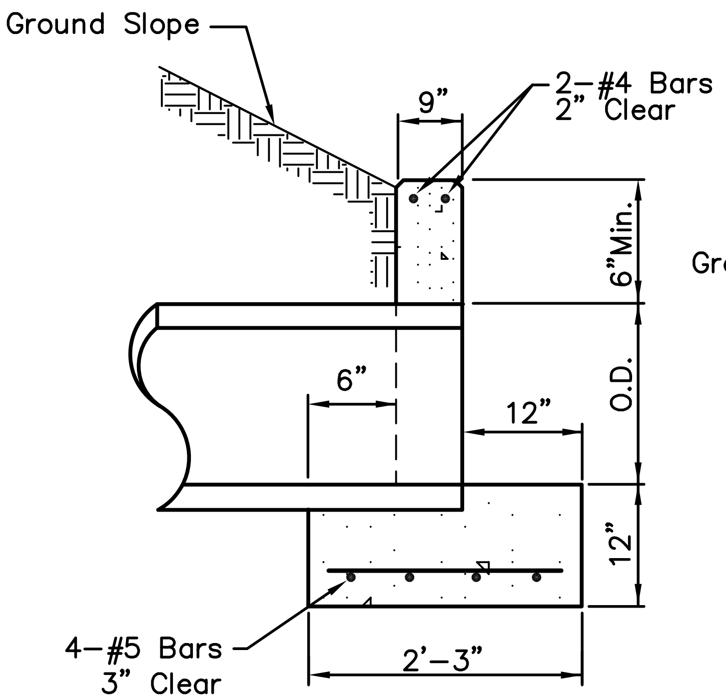


NOTES:

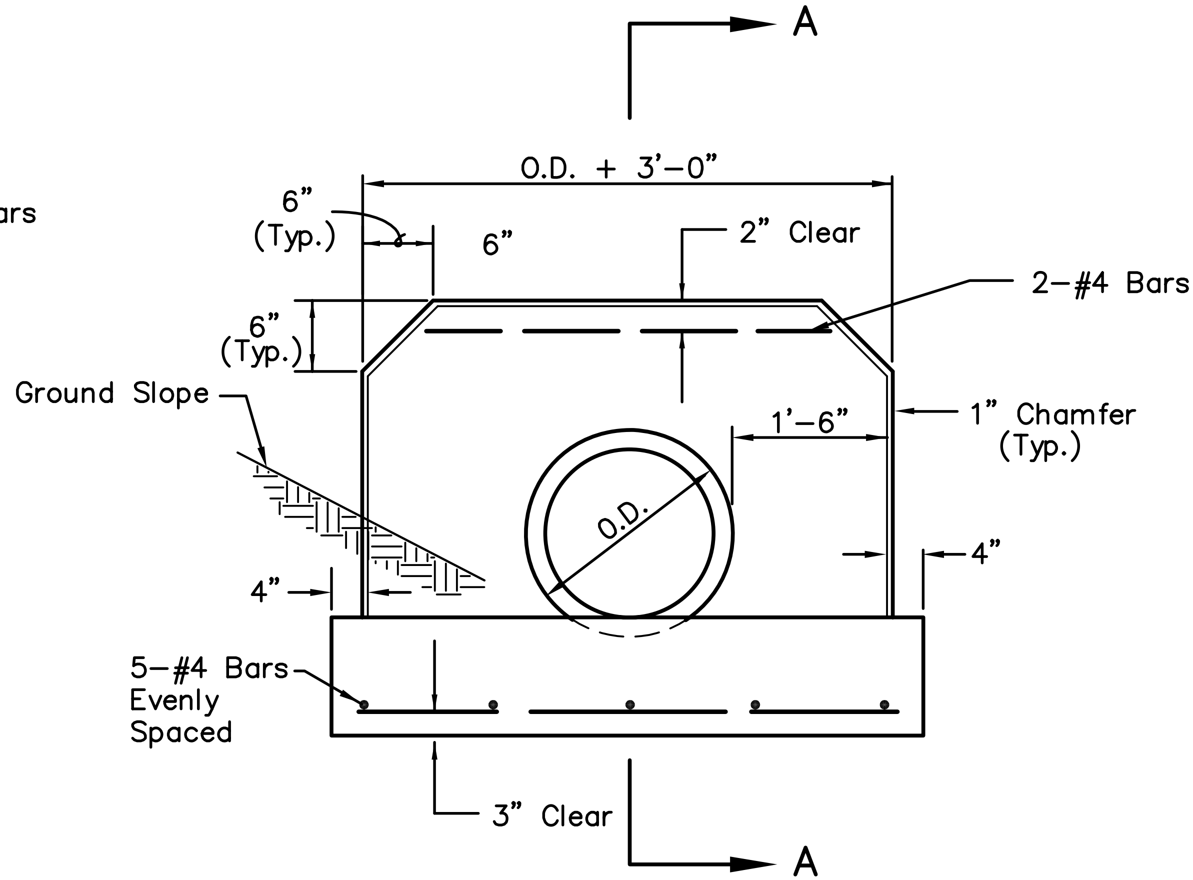
1. Material: Gray Iron ASTM A-48, (Latest Rev.) Class 35-B.
2. Design for H-25 loading.
3. Fits opening size of 2'-0 1/4" x 3'-1".
4. NEENAH R-3157-A w/ SPECIAL 6" HIGH FRAME, TYPE "L" VANE GRATE, AND CURB BOX; or approved equal.
5. Curb iron must include either environmental message:
   (1) DUMP NO WASTE...DRAINS TO STREAM
   (2) NO DUMPING... DRAINS TO STREAM
6. Minimum Weights:
   Grate = 76lbs./ea., Frame = 335lbs., Curb Iron = 115lbs.

CURB CATCH BASIN – DOUBLE FRAME AND GRATE – TYPE 2-L
STANDARD DRAWING NO. DG-04-04
DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



SECTION A-A



ELEVATION

NOTES:

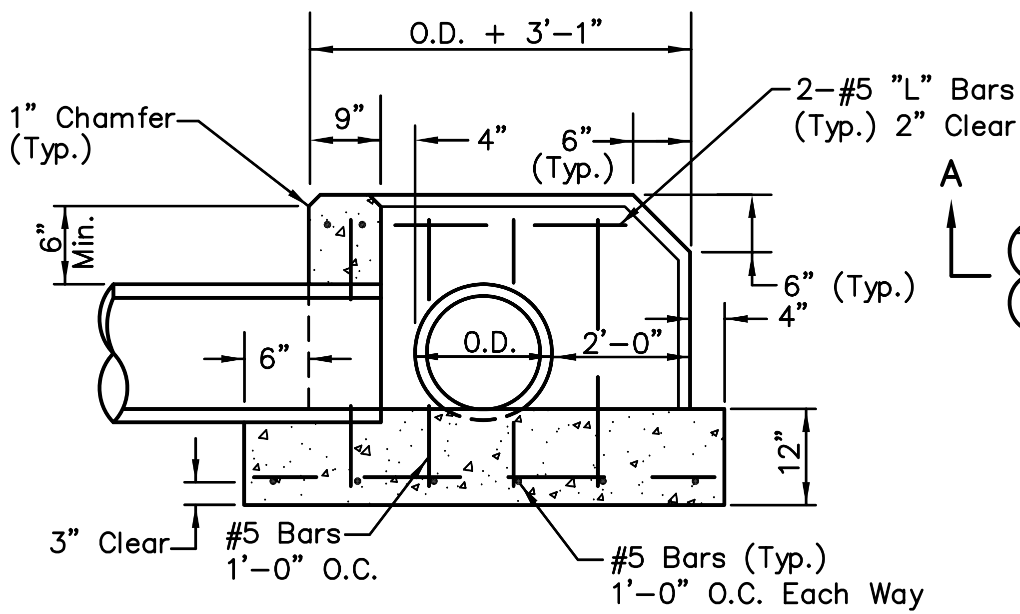
1. Concrete shall be Class "A".
2. Reinforcing steel shall be Grade 60.
3. For use with 24" Pipe or smaller (Circular or Non-circular)

STANDARD HEADWALL

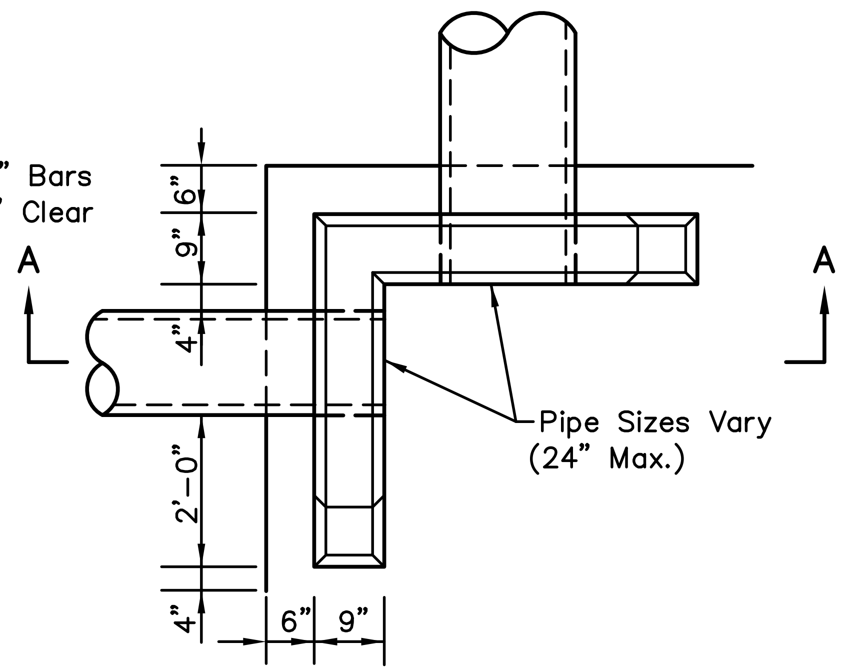
STANDARD DRAWING NO. DH-01-01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



SECTION A-A



PLAN

NOTES:

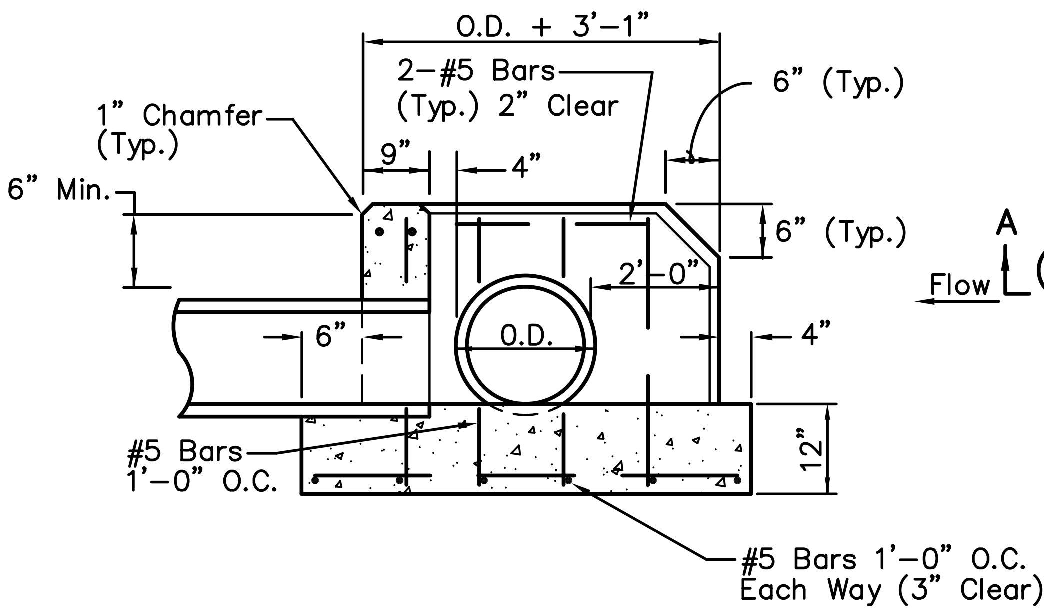
1. All reinforcing steel shall be Grade 60.
2. Concrete shall be Class "A".
3. For use with 24" Pipe or smaller. (Circular or Non-circular)

ELL HEADWALL

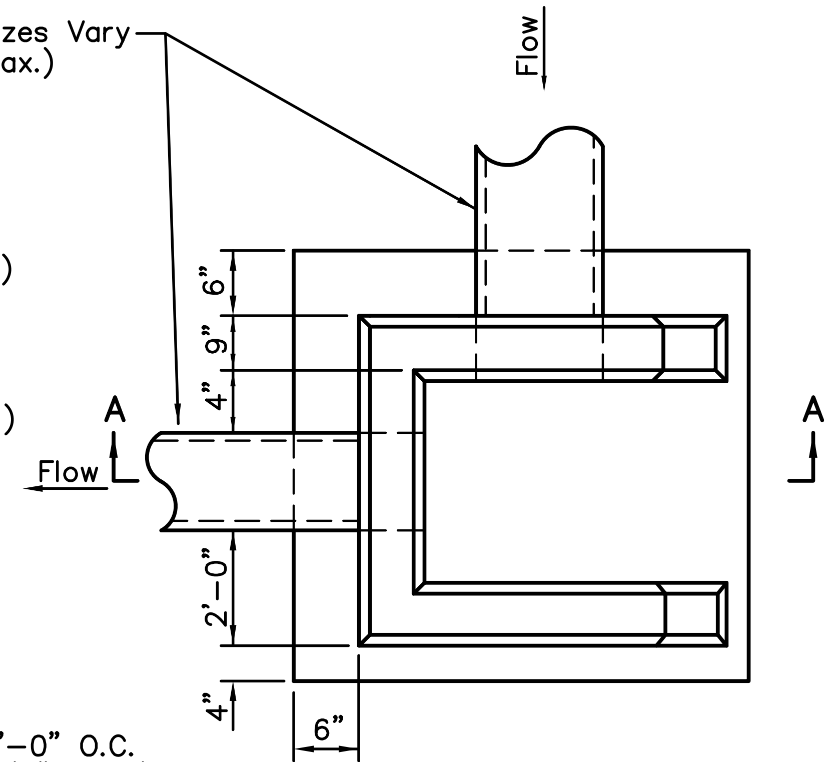
STANDARD DRAWING NO. DH-02-01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



SECTION A-A



PLAN

NOTES:

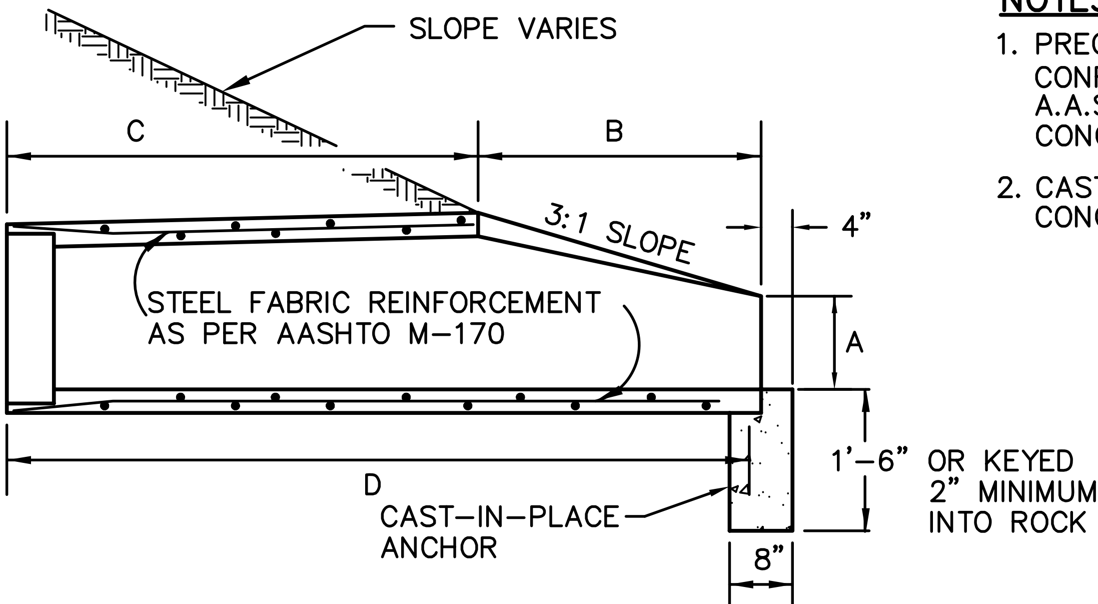
1. All reinforcing steel shall be grade 60.
2. All concrete shall be Class "A".
3. For use with 24" pipe or smaller.
   (Circular or Non-circular)

"U" - SHAPED HEADWALL

STANDARD DRAWING NO. DH-03-01

DECEMBER 2012

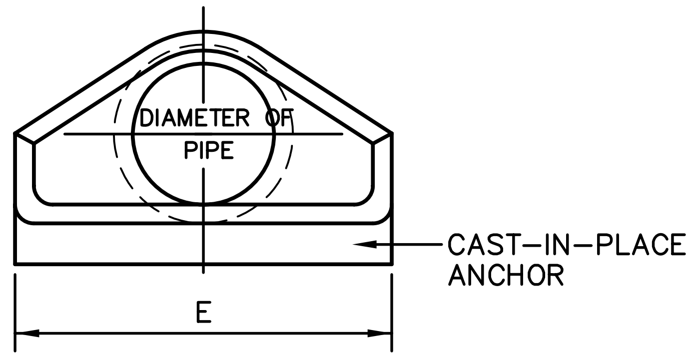
*This is a detail from MSD Standard Drawings dated 9-30-09.



SECTION X-X

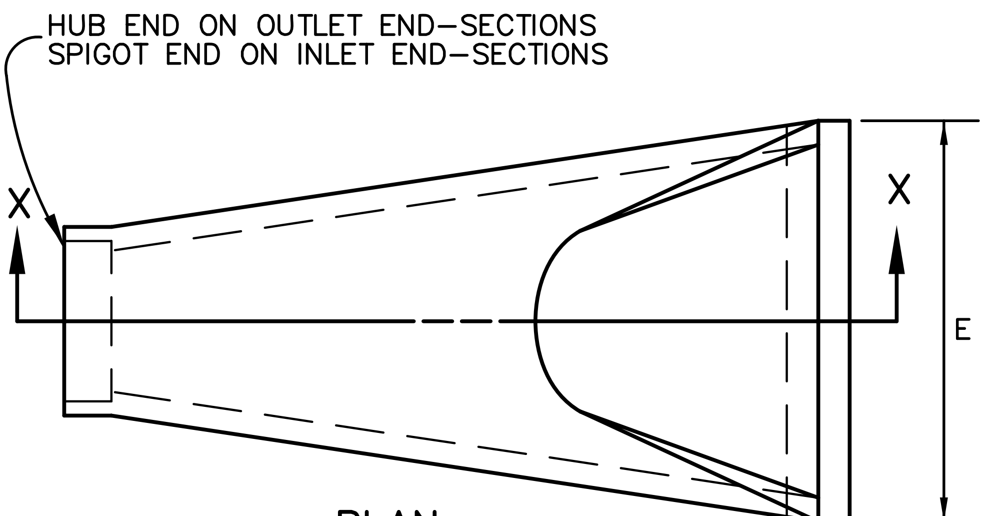
NOTES

1. PRECAST CONCRETE FLARED END SECTION SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF A.A.S.H.T.O. M-170 CLASS III, WALL B REINFORCED CONCRETE PIPE.
2. CAST-IN-PLACE ANCHOR SHALL BE OF CLASS "A" CONCRETE FOR FULL WIDTH OF FLARED END SECTION.



END VIEW

END SECTION DIMENSIONS					
DIA.	**A**	**B**	**C**	**D**	**E**
12"	4"	2'-0"	4'-1"	6'-1"	2'-0"
15"	6"	2'-3"	3'-10"	6'-1"	2'-6"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"
24"	10"	3'-7"	2'-8"	6'-3"	4'-0"
30"	1'-0"	4'-6"	1'-7 3/4"	6'-1 3/4"	5'-0"
36"	1'-3"	5'-3"	2'-10 3/4"	8'-1 3/4"	6'-0"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"



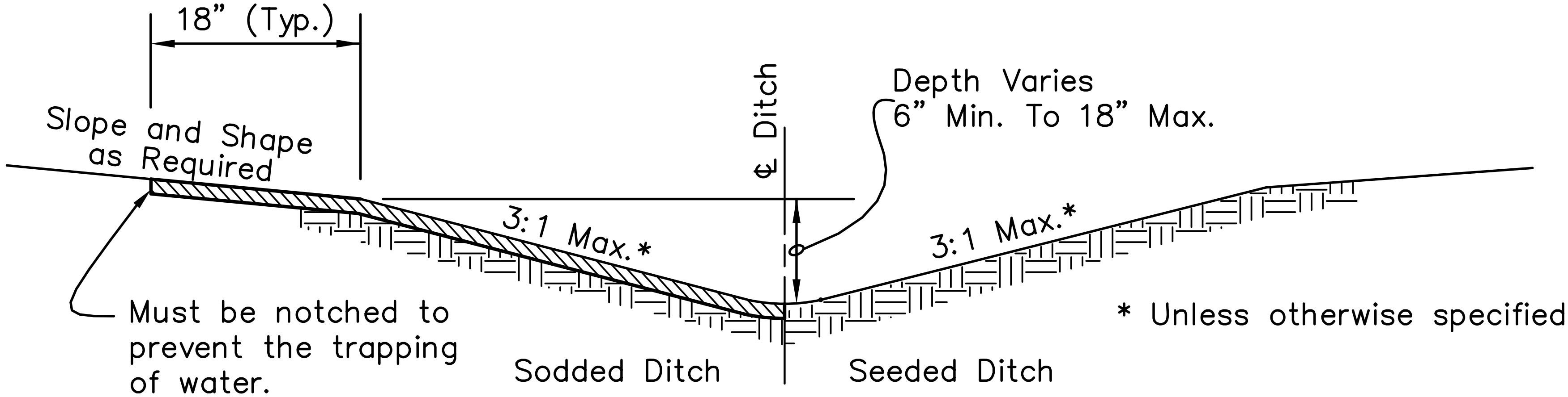
PLAN

FLARED END SECTION
FOR R.C.P.

STANDARD DRAWING NO. DE-01-01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



NOTES:

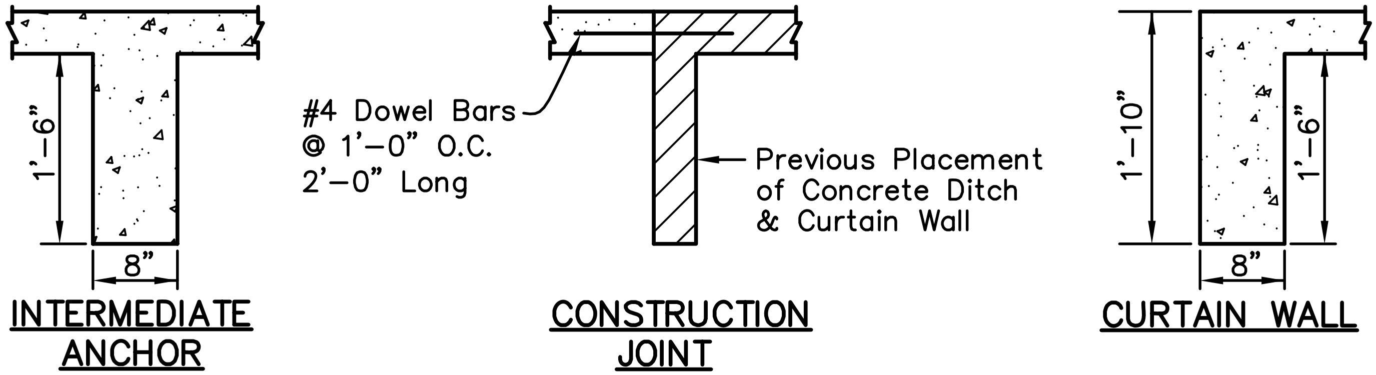
1. Sodded or seeded ditches should not be used where slopes are 10% or greater or where the velocity is greater than 4 feet per second.
2. Sod shall be placed so that ditches shall be free-draining at the edge of all pavements and driveways.
3. Ditch lining shall be designed for full bank flow.

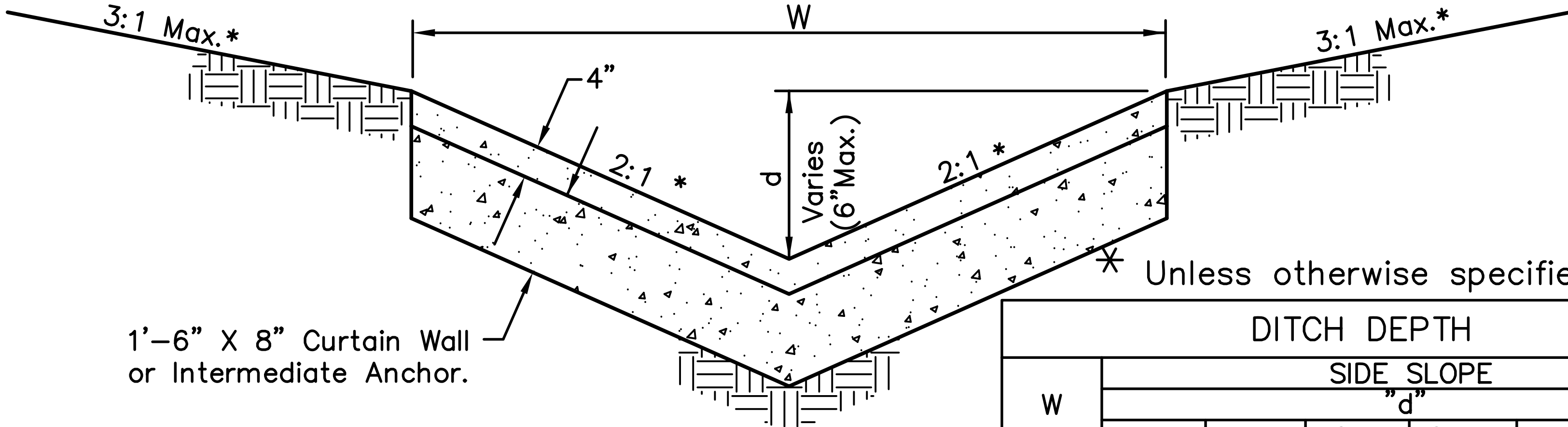
EARTH "V" DITCH

STANDARD DRAWING NO. DD-01-01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.





* Unless otherwise specified

DITCH DEPTH						
W	SIDE SLOPE "d"					
	1:1	1.5:1	2:1	2.5:1	3:1	4:1
1'–0"	6"	4"	3"	2 3/8"	2"	1 1/2"
1'–6"	–	6"	4 1/2"	3 5/8"	3"	2 1/4"
2'–0"	–	–	6"	5"	4"	3"
2'–6"	–	–	–	6"	5"	3 3/4"
3'–0"	–	–	–	–	6"	4 1/2"
4'–0"	–	–	–	–	–	6"

NOTES:

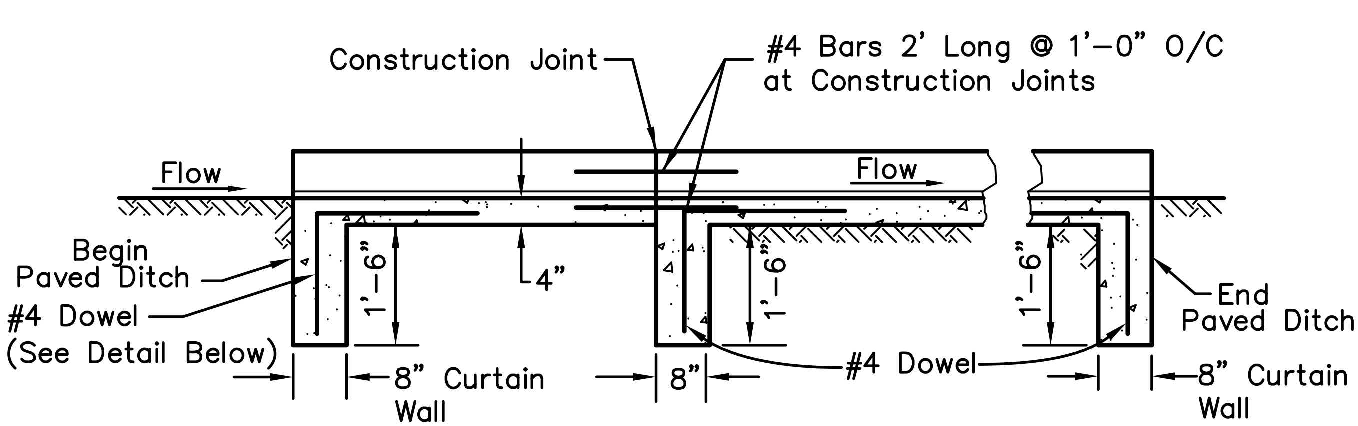
1. Invert may be finished as a radius.
2. Curtain wall shall be constructed at beginning and end of ditch.
3. If a construction joint is used in the placing of the paved ditch, it shall be constructed with a curtain wall as detailed.
4. The ditch shall be Class "A" concrete with polypropylene fiber.
5. Intermediate anchors shall be used on grades 20% or steeper and spaced every 20 feet.
6. Sawed or tooled joints shall be spaced every 20 feet, (max.).
7. Broom finish perpendicular to flow.

PAVED "V" DITCH

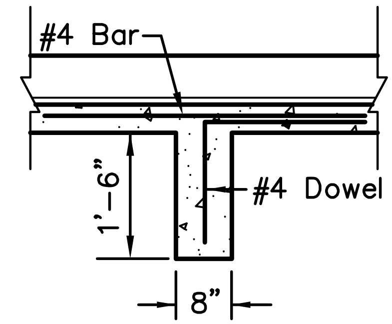
STANDARD DRAWING NO. DD–02–01

DECEMBER 2012

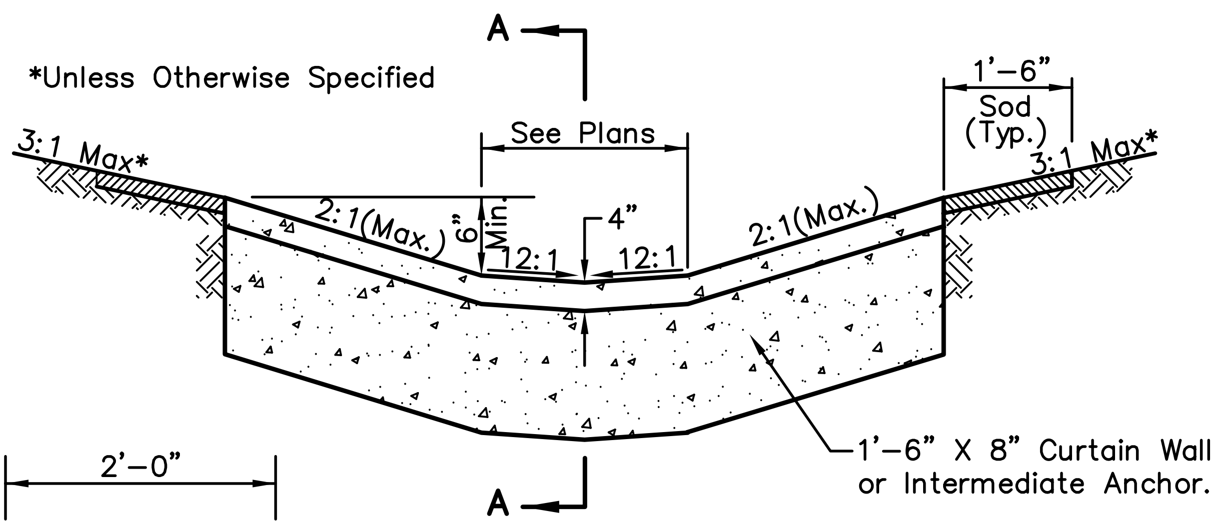
*This is a detail from MSD Standard Drawings dated 9-30-09.



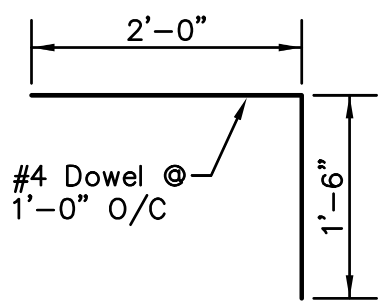
LONGITUDINAL SECTION A–A



INTERMEDIATE ANCHOR



TYPICAL SECTION



DOWEL DETAIL

NOTES:

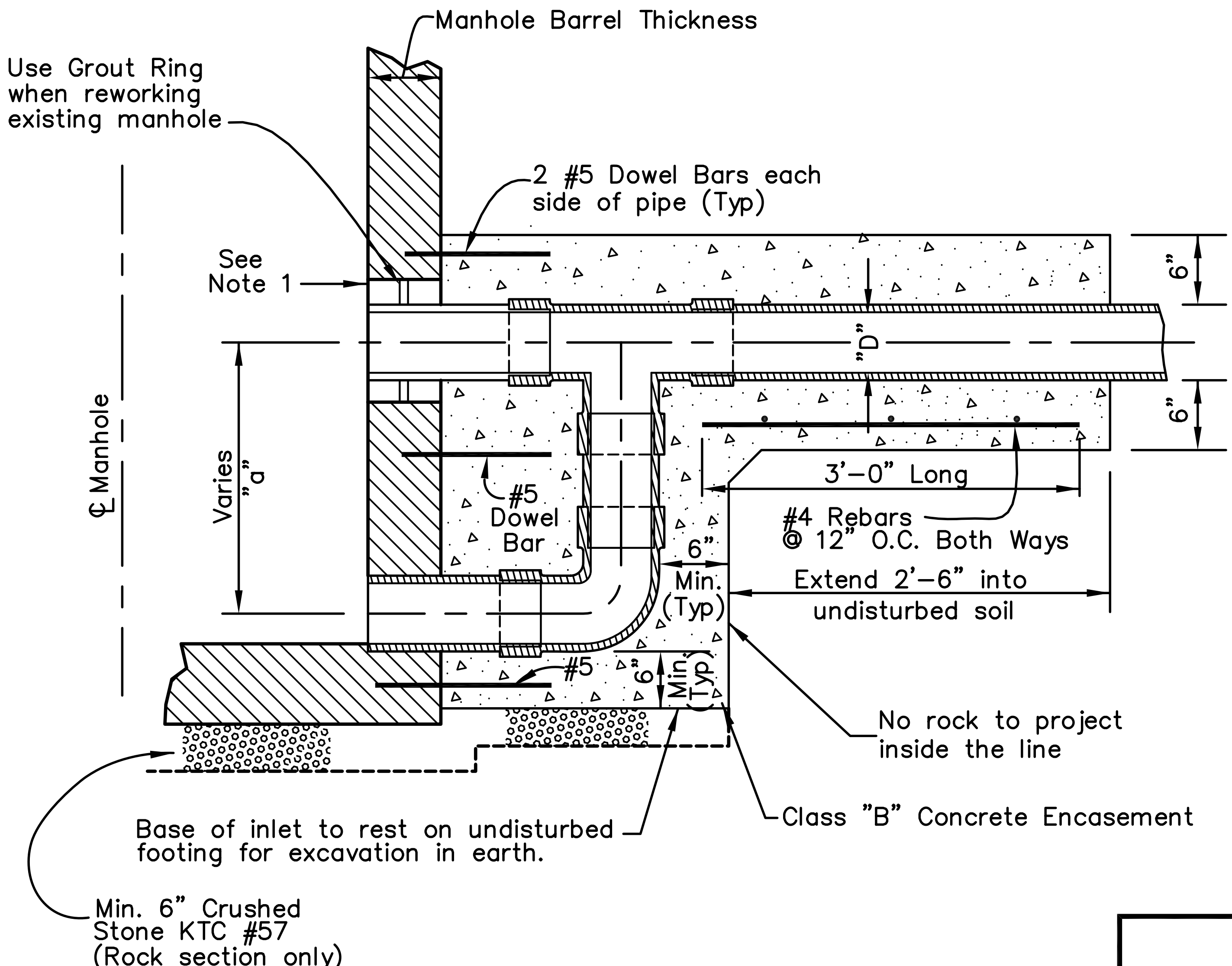
1. Class A Concrete with Polypropylene Fiber.
2. Curtain Wall shall be constructed at Beginning and End of Ditch.
3. If a Construction Joint is used in the placing of the Ditch, it shall be constructed as Detailed.
4. Intermediate Anchors shall be used on Grades 20% or Steeper and spaced every 20 feet.
5. Tooled Joints shall be placed every 20 feet (Max.)
6. Broom finish perpendicular to flow.
7. All Reinforcing Steel shall be Grade 60.

SLOPED BOTTOM
PAVED DITCH

STANDARD DRAWING NO. DD–03–01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



P.V.C. DROP INLET CHART

Minimum Dimensions ℄ to ℄ "a"	"D" I.D. of Pipe & Drop Inlet
16"	4"
20"	6"
24"	8"
26"	9"
27"	10"
31"	12"
37"	15"
47"	18"
51"	21"
64"	24"
73"	27"

NOTE

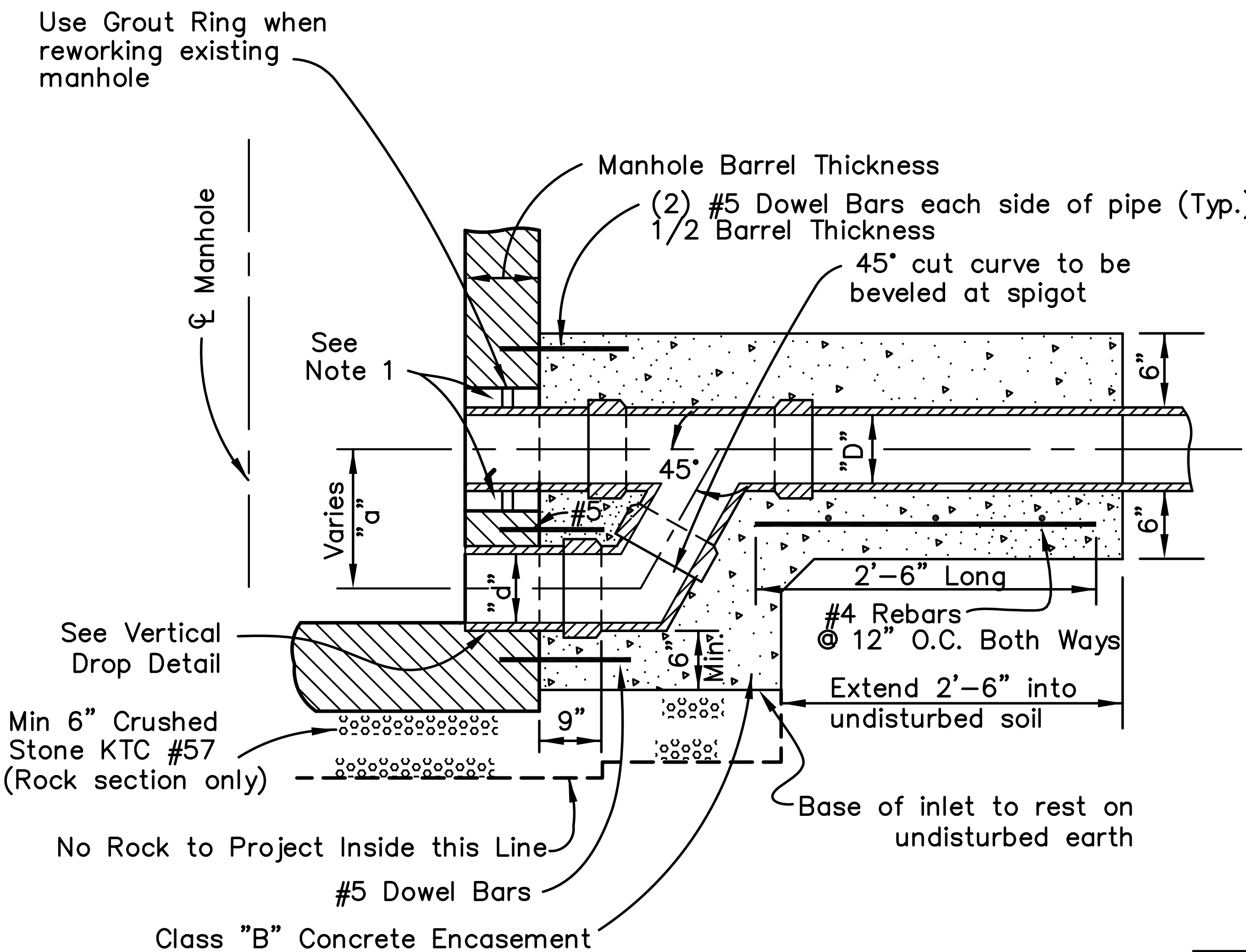
1. Sewer Pipe Connection to precast manhole with Positive Seal Gasketing System(A.S.T.M. C–923). Gasket shall be as manufactured by the Press Seal Gasket Co., A–Lok or Kor–N–Seal manhole pipe connectors or approved equal for sanitary sewers.

P.V.C. VERTICAL DROP INLET

STANDARD DRAWING NO. SD–01–01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



P.V.C. DROP INLET CHART

Minimum Dimensions ℄ to ℄ "a"	"D" I.D. of Pipe & Drop Inlet
16"	4"
20"	6"
24"	8"
26"	9"
27"	10"
31"	12"
37"	15"
47"	18"
51"	21"
64"	24"
73"	27"

NOTE:

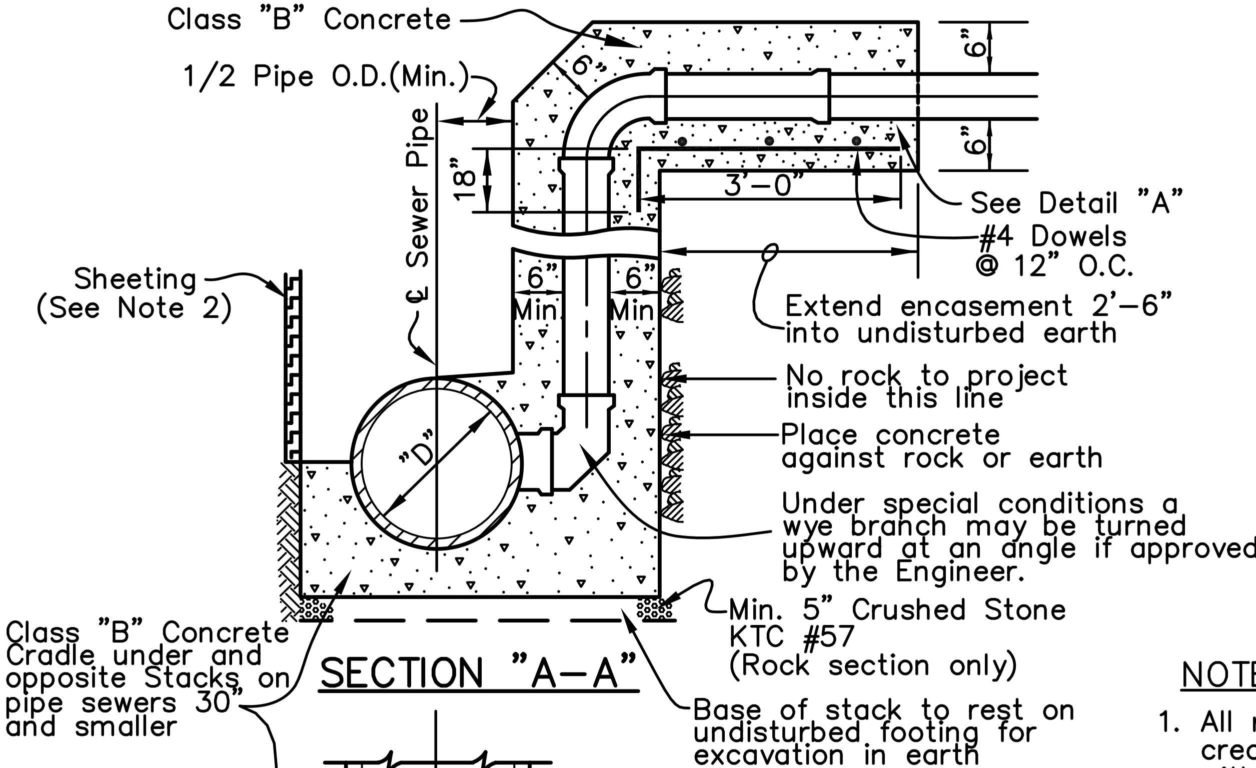
1. Sewer pipe connection to precast manhole with Positive Seal Gasketing System(A.S.T.M. C-923). Gasket shall be as manufactured A-lok or Kor-N-Seal Manhole pipe connectors or approved equal for sanitary sewers

P.V.C. SLANTING DROP INLET

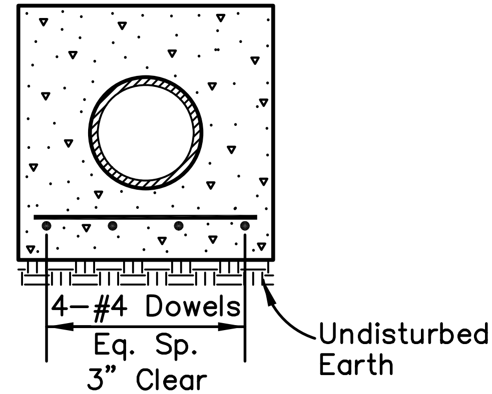
STANDARD DRAWING NO. SD-02-01

DECEMBER 2012

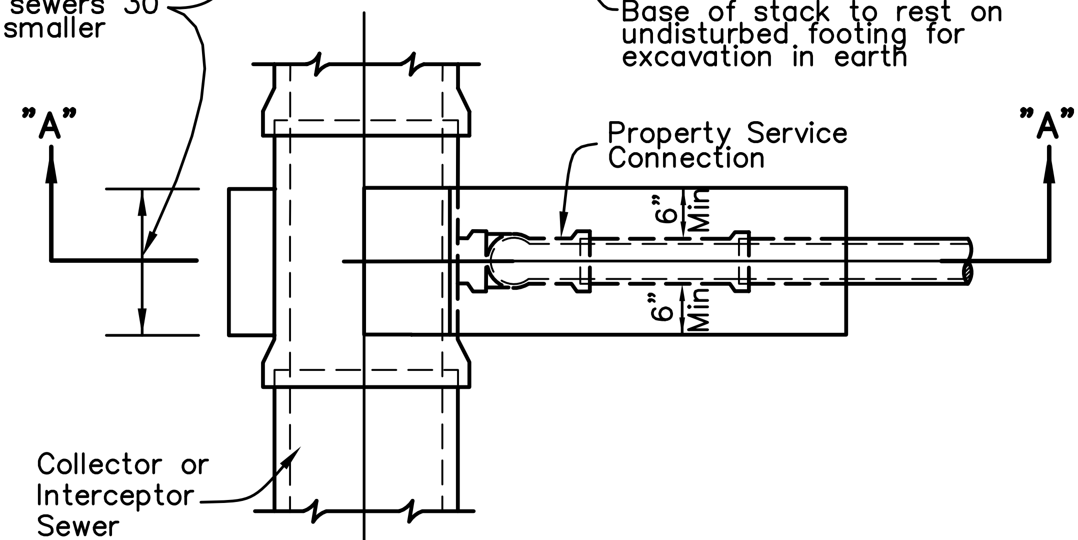
*This is a detail from MSD Standard Drawings dated 9-30-09.



SECTION "A-A"



DETAIL "A"



PLAN

NOTES:

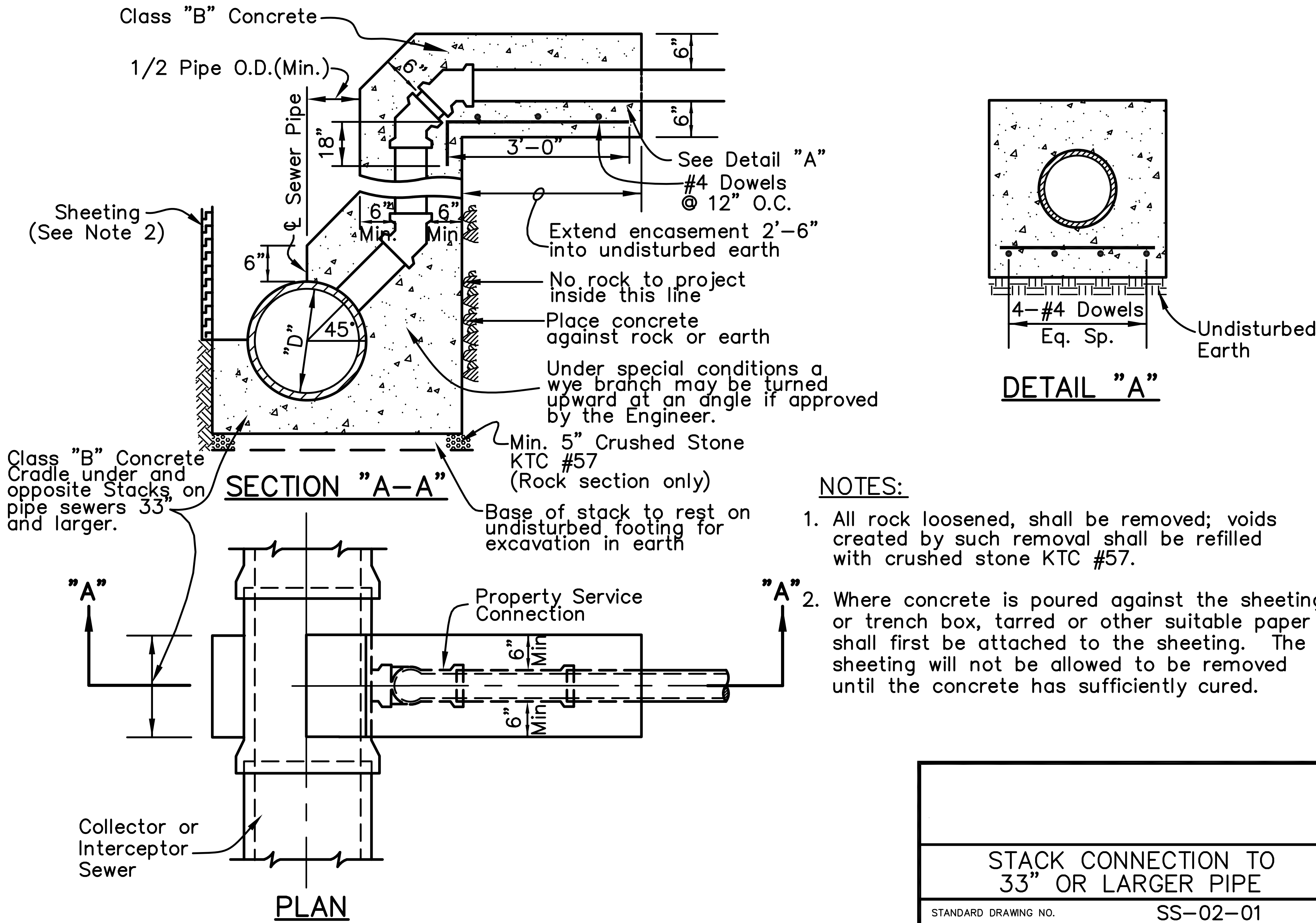
1. All rock loosened, shall be removed; voids created by such removal shall be refilled with crushed stone KTC #57.
2. Where concrete is poured against the sheeting or trench box, tarred or other suitable paper shall first be attached to the sheeting. The sheeting will not be allowed to be removed until the concrete has sufficiently cured.

STACK CONNECTION TO 30" OR SMALLER PIPE

STANDARD DRAWING NO. SS-01-01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



NOTES:

1. All rock loosened, shall be removed; voids created by such removal shall be refilled with crushed stone KTC #57.
2. Where concrete is poured against the sheeting or trench box, tarred or other suitable paper shall first be attached to the sheeting. The sheeting will not be allowed to be removed until the concrete has sufficiently cured.

STACK CONNECTION TO 33" OR LARGER PIPE

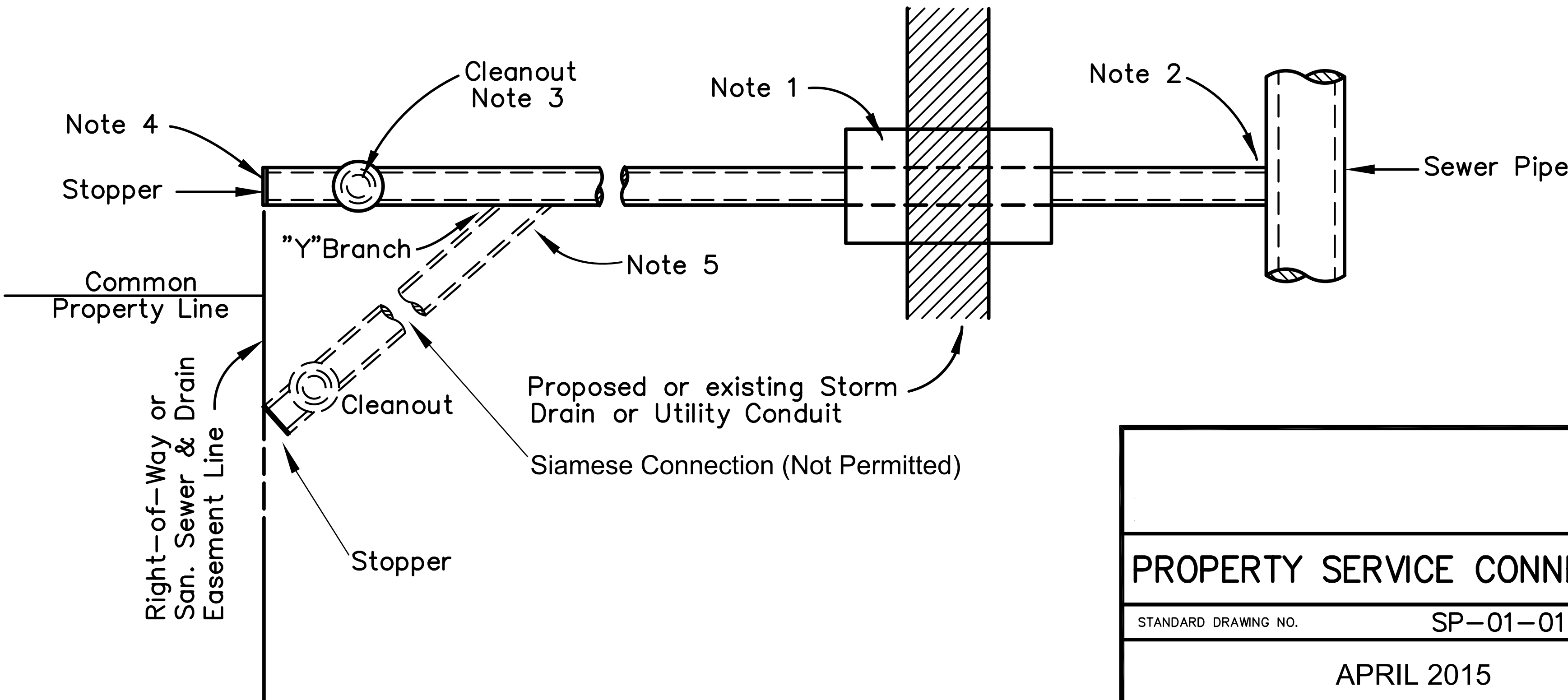
STANDARD DRAWING NO. SS-02-01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.

NOTES

1. Property service connections crossing under (over) the storm drain or utility conduit proposed or existing with less than (2) feet of clearance shall be capped (cradled) with 6" Class "B" Concrete in accordance with the typical concrete cap (concrete cradle) detail. The minimum clearance is 6–inches for all utilities and storm drains and 18–inches for water lines.
2. The contractor may install "T" Branches in lieu of "Y" Branches for connecting property service connections to the sewer. The contractor shall use "spurs" in the "T" Branches on all Reinforced Concrete Pipe sanitary sewers.
3. **A two-way cleanout will be required on individual connections placed as near as possible to the intersection of the common property line and the R.O.W. or sanitary sewer and drain easement line as shown.**
4. The invert of a property service connection at end shall not be lower than crown of sewer pipe, unless approved by the engineer.
5. **Siamese Connections are not permitted.**
6. **Detectable marking tape shall be installed.**

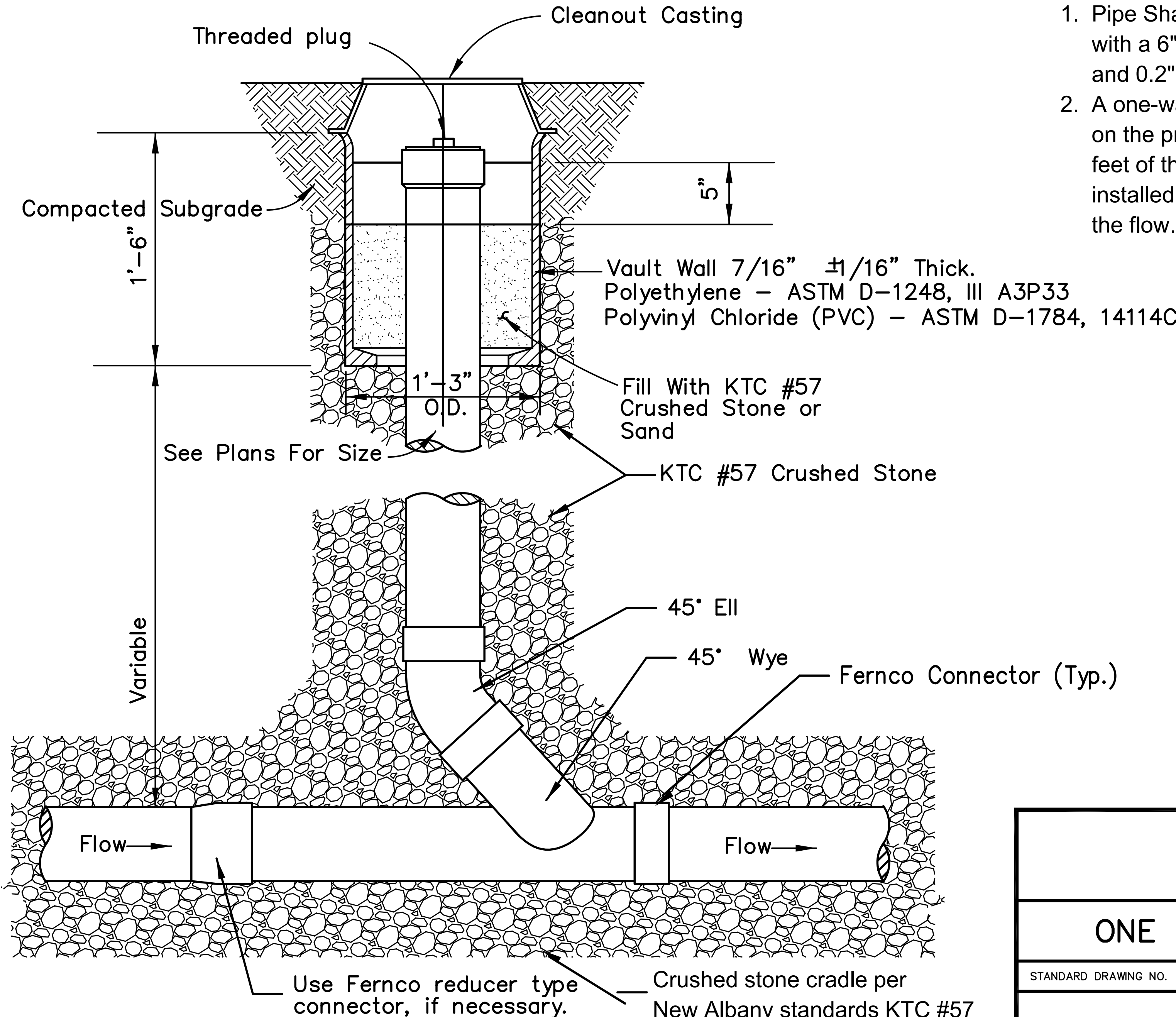


PROPERTY SERVICE CONNECTION
STANDARD DRAWING NO. SP–01–01
APRIL 2015

*This is a detail from MSD Standard Drawings dated 9-30-09.

Notes:

1. Pipe Shall Be DR 32.5 HDPE with a 6" inside diameter (IPS) and 0.2" wall thickness.
2. A one-way cleanout is required on the property service line within 10 feet of the exterior wall and shall be installed to open in the direction of the flow.



ONE WAY CLEANOUT

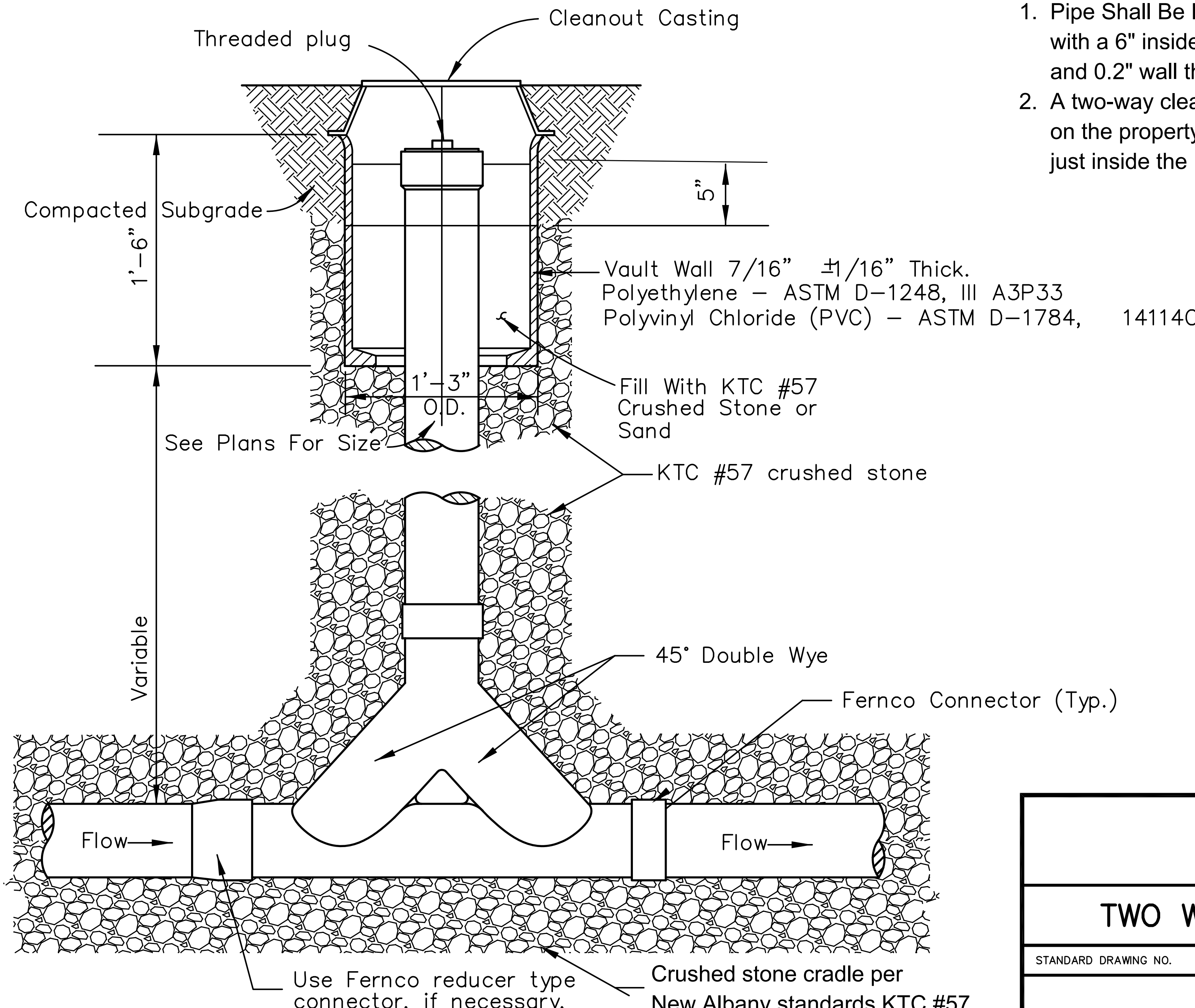
STANDARD DRAWING NO. SC–01–02

APRIL 2015

*This is a detail from MSD Standard Drawings dated 9-30-09.

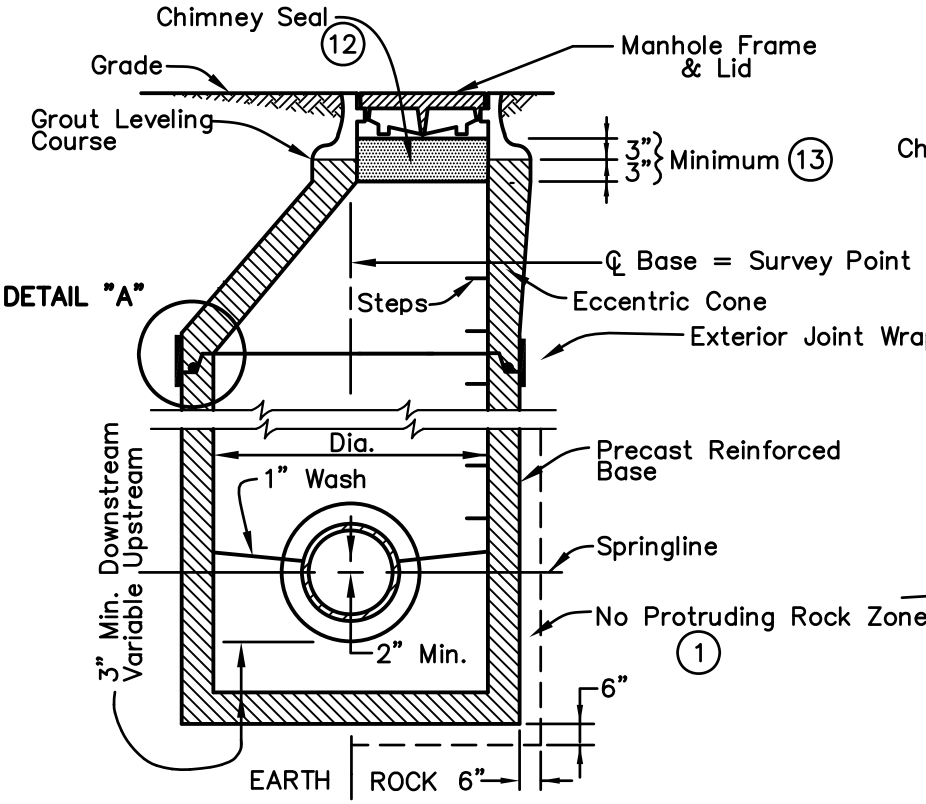
Notes:

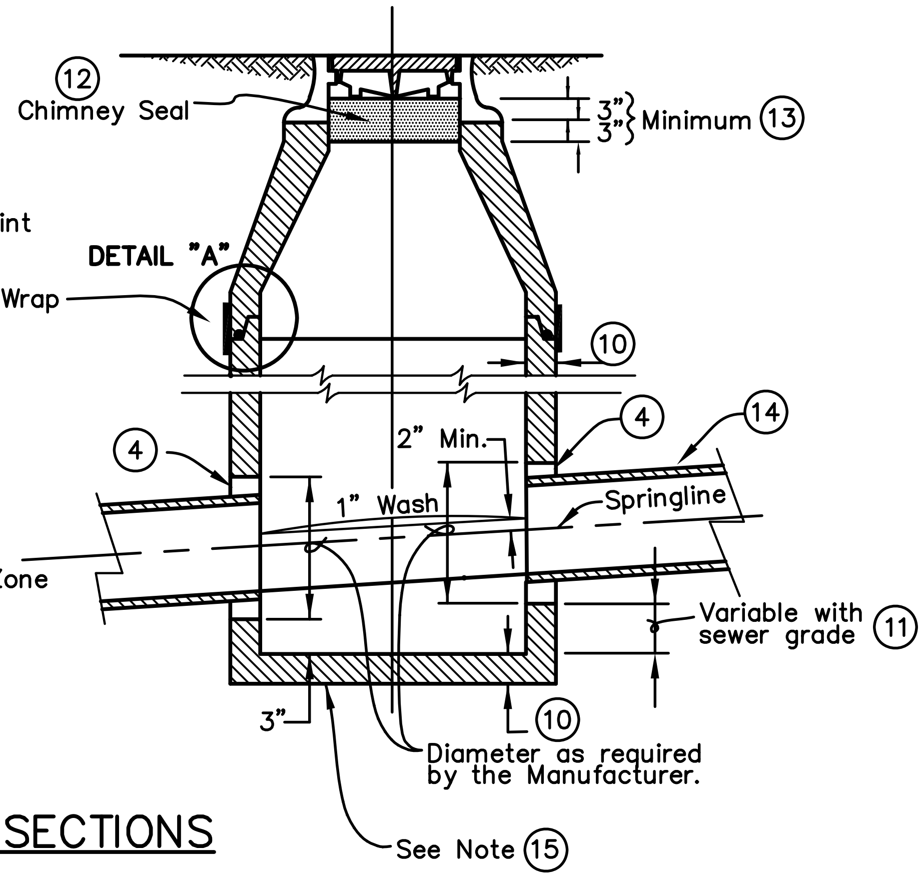
1. Pipe Shall Be DR 32.5 HDPE with a 6" inside diameter (IPS) and 0.2" wall thickness.
2. A two-way cleanout is required on the property service connection just inside the R/W or easement line.



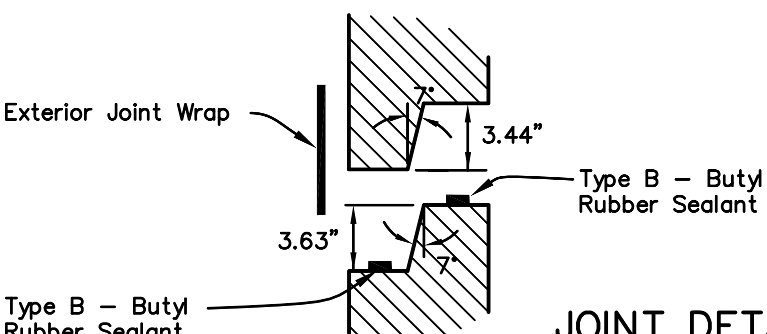
TWO WAY CLEANOUT	
STANDARD DRAWING NO.	SC–02–02
APRIL 2015	

*This is a detail from MSD Standard Drawings dated 9-30-09.





TYPICAL SECTIONS



JOINT DETAIL "A"

FOR NOTES SEE STANDARD DRAWING
GM–01–04 Page 2 of 2

PRECAST MANHOLE – TYPE 1
STANDARD DRAWING NO. GM–01–04 Page 1 of 2
DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.

NOTES

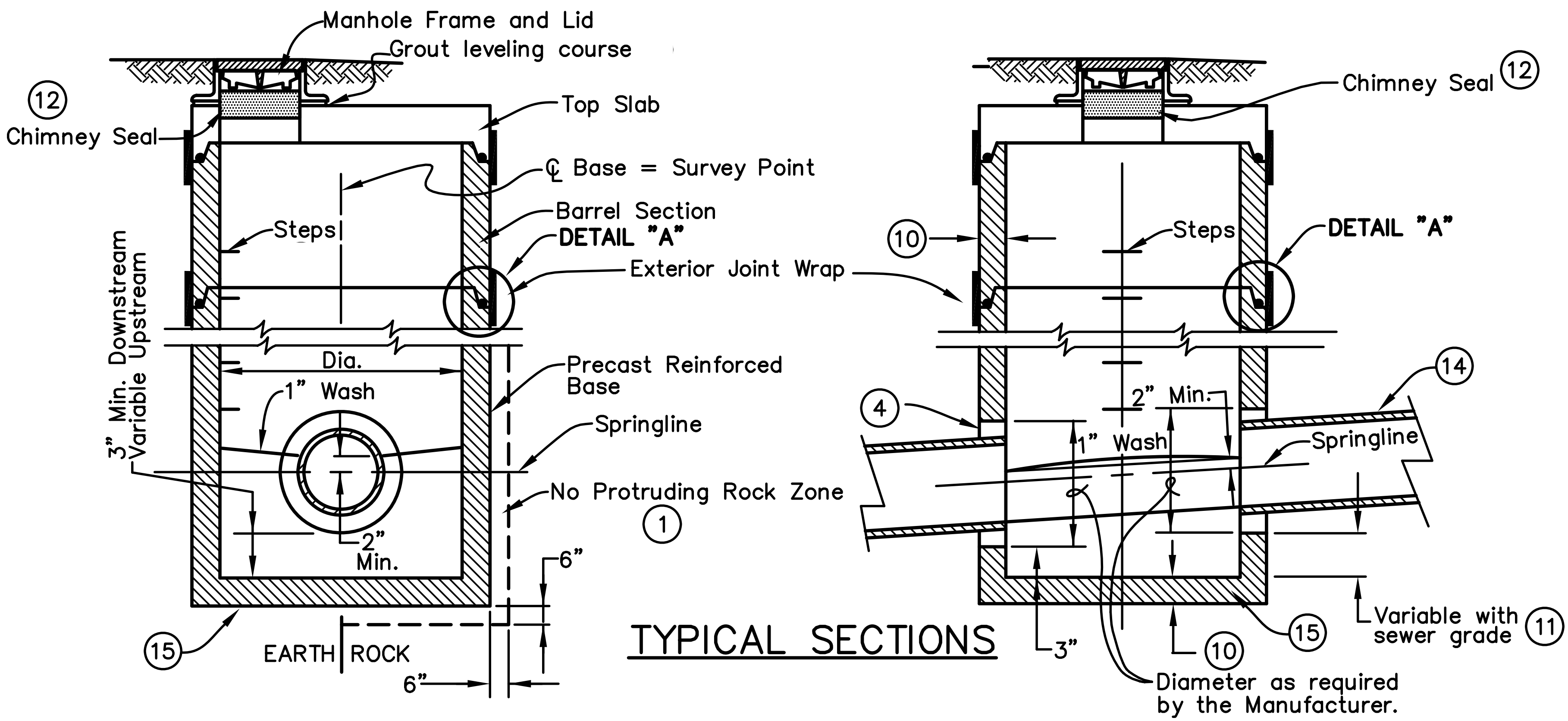
1. All rock loosened, shall be removed. Voids created by such removal shall be refilled with Crushed Stone KTC #57.
2. **Chimney seals and exterior joint wraps are not required for New Albany storm manholes.**
3. In lieu of poured Class "A" concrete inverts, precast inverts may be substituted.
4. Sewer pipe connection to precast manhole with positive seal gasketing system (ASTM. C–923). Gasket shall be as manufactured by the Press Seal Gasket Co., A–lok, Kor–N–Seal or equal with stainless steel banded manhole pipe connectors for sanitary sewers.
5. **Not used.**
6. No rock fragments will be allowed within 6–inches of structure.
7. Manhole shall meet all of the requirements of ASTM. C478, C913.
8. **Backfill according to New Albany Standard Specifications.**
9. Total height of all collars shall not exceed 12 inches.
10. 5" for 48" diameter, 6" for 60" diameter and 7" for 72" diameter.
11. Manhole inverts shall have a minimum of 0.10' fall through the structure unlees any line exceeds 10%, at which point the "variable with sewer grade" note applies.
12. **Internal mechanical Chimney seals are required on all New Albany sanitary manholes. Chemical bonding for chimney seals is to be used only for rehabilitation and only in non-paved areas. At a minimum, the seal will extend from a point 3 inches above the base of the manhole frame, to a point 3 inches below the top of the concrete cone or top slab. If grade adjustments collars are used, the seal height will increase proportionally to the collar height.**
13. The top of the concrete cone or top slab must have a minimum 3 inch vertical surface that is smooth and free of any form offsets or excessive honeycomb.
14. Install flexible push–on joint 3 feet from manhole to allow for settlement and reduce bending moments.
15. All base sections shall be monolithic.
16. **Not used.**

PRECAST MANHOLE – TYPE 1

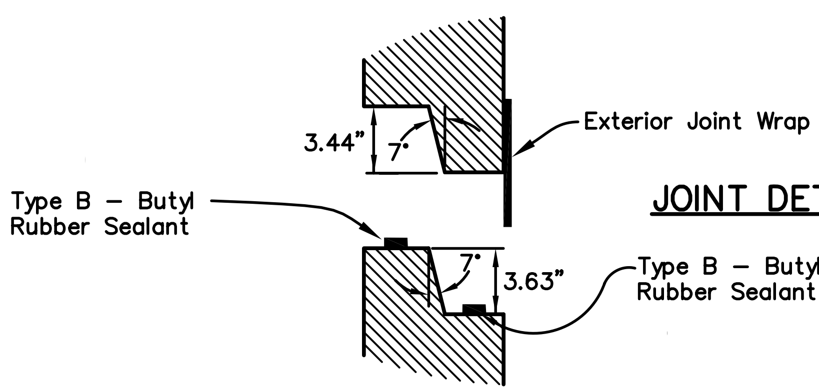
STANDARD DRAWING NO. GM–01–04 Page 2 of 2

APRIL 2015

*This is a detail from MSD Standard Drawings dated 9-30-09.



TYPICAL SECTIONS



JOINT DETAIL "A"

FOR NOTES SEE STANDARD DRAWINGS
GM–02–04 Page 2 of 2

PRECAST MANHOLE – TYPE 2

STANDARD DRAWING NO. GM–02–04 Page 1 of 2

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.

NOTES

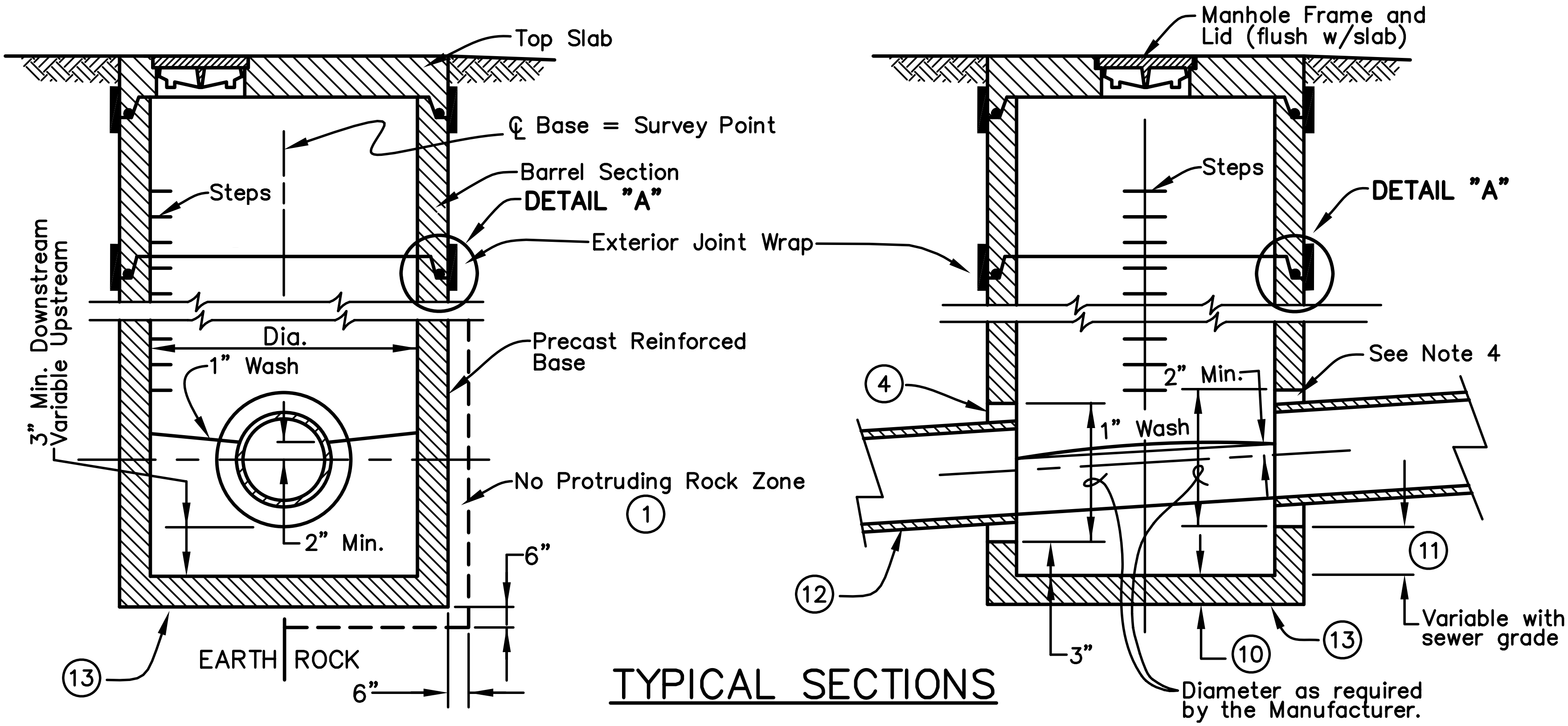
1. All rock loosened, shall be removed. Voids created by such removal shall be refilled with Crushed Stone KTC #57.
2. **Chimney seals and exterior joint wraps are not required for New Albany storm manholes.**
3. In lieu of poured Class "A" concrete inverts, precast inverts may be substituted.
4. Sewer pipe connection to precast manhole with positive seal gasketing system (ASTM. C-923). Gasket shall be as manufactured by the Press Seal Gasket Co., A-lok, Kor-N-Seal or equal with stainless steel banded manhole pipe connectors for sanitary sewers.
5. Not used.
6. No rock fragments will be allowed within 6-inches of structure.
7. Manhole shall meet all of the requirements of ASTM. C478, C913.
8. Backfill according to New Albany Standard Specifications.
9. Total height of all collars shall not exceed 12 inches.
10. 5" for 48" diameter, 6" for 60" diameter and 7" for 72" diameter.
11. Manhole inverts shall have a minimum of 0.10' fall through the structure unlees any line exceeds 10%, at which point the "variable with sewer grade" note applies.
12. **Chimney seals, either internally mechanical or chemical, will be required on all new New Albany sanitary manholes. At a minimum, the seal will extend from a point 3 inches above the base of the manhole frame, to a point 3 inches below the top of the concrete cone or top slab. If grade adjustments collars are used, the seal height will increase proportionally to the collar height.**
13. The top of the concrete cone or top slab must have a minimum 3 inch vertical surface that is smooth and free of any form offsets or excessive honeycomb.
14. Install flexible push-on joint 3 feet from manhole to allow for settlement and reduce bending moments.
15. All base sections shall be monolithic.
16. Not used.

PRECAST MANHOLE – TYPE 2

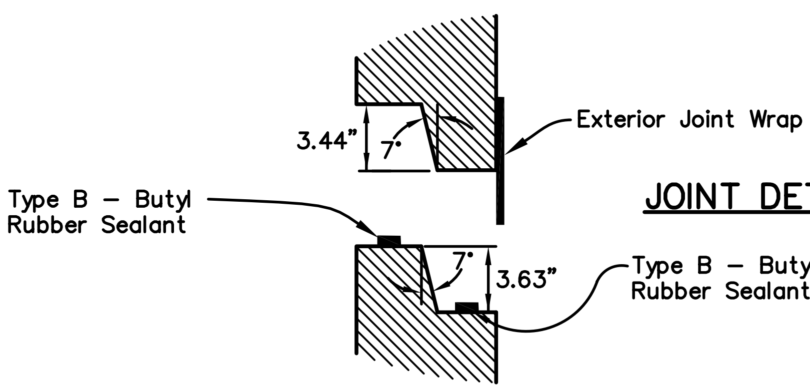
STANDARD DRAWING NO. GM-02-04 Page 2 of 2

APRIL 2015

*This is a detail from MSD Standard Drawings dated 9-30-09.



TYPICAL SECTIONS



JOINT DETAIL "A"

FOR NOTES SEE STANDARD DRAWINGS GM–03–04 Page 2 of 2

PRECAST MANHOLE – TYPE 3

STANDARD DRAWING NO. GM–03–04 Page 1 of 2

DECEMBER 2012

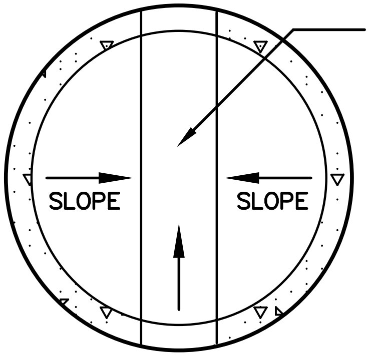
*This is a detail from MSD Standard Drawings dated 9-30-09.

NOTES

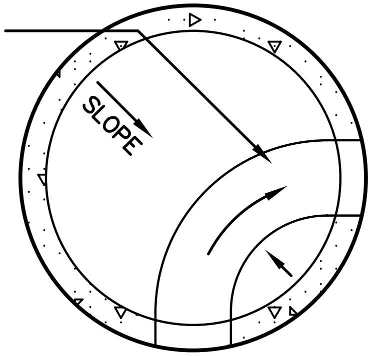
1. All rock loosened, shall be removed. Voids created by such removal shall be refilled with Crushed Stone KTC #57.
2. **Exterior joint wraps are not required for New Albany storm manholes.**
3. In lieu of poured Class "A" concrete inverts, precast inverts may be substituted.
4. Sewer pipe connection to precast manhole with positive seal gasketing system (ASTM. C–923). Gasket shall be as manufactured by the Press Seal Gasket Co., A–lok, Kor–N–Seal or equal with stainless steel banded manhole pipe connectors for sanitary sewers.
5. **Not used.**
6. No rock fragments will be allowed within 6–inches of structure.
7. Manhole shall meet all of the requirements of ASTM. C478, C913.
8. **Backfill according to New Albany Standard Specifications.**
9. Total height of all collars shall not exceed 12 inches.
10. ~~5" for 48"~~ **Not used.**
11. Manhole inverts shall have 0.10' of fall through the structure unlees any line exceeds 10%, at which point the "variable with sewer grade" note applies.
12. Install flexible push–on joint 3 feet from manhole to allow for settlement and reduce bending moments.
13. All base sections shall be monolithic.
14. **Not used.**

PRECAST MANHOLE – TYPE 3
STANDARD DRAWING NO. GM–03–04 Page 2 of 2
APRIL 2015

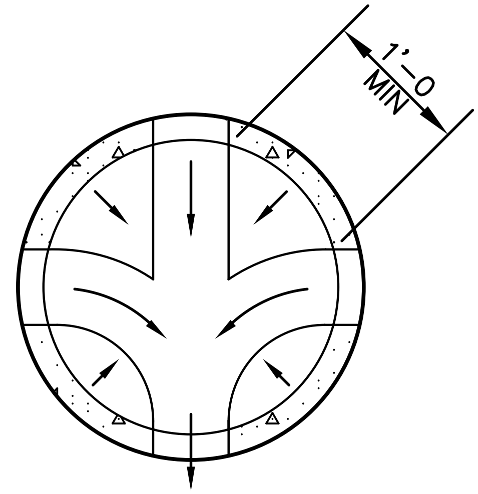
*This is a detail from MSD Standard Drawings dated 9-30-09.



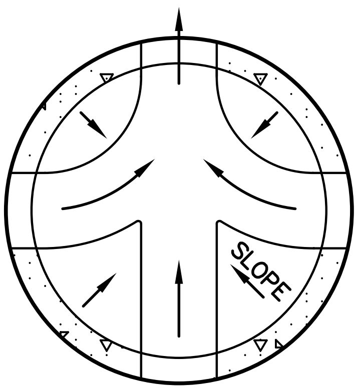
TYPICAL STRAIGHT FLOW



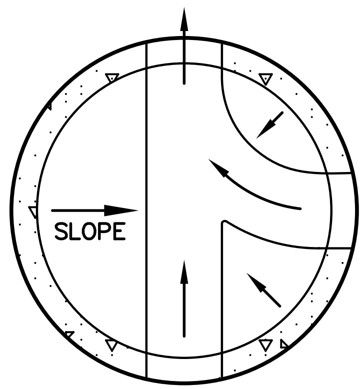
TYPICAL CURVE FLOW



MINIMUM DISTANCE BETWEEN
OPENING FOR PIPE



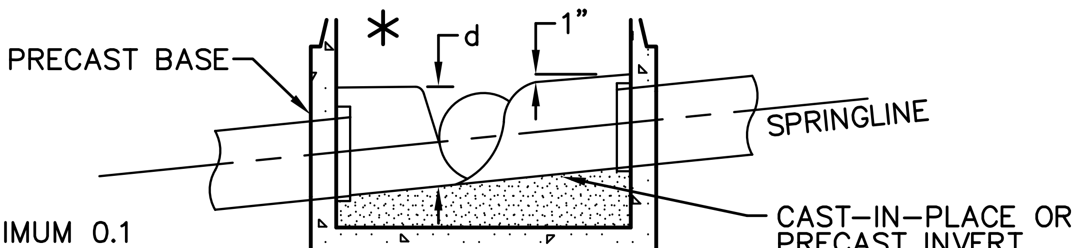
TYPICAL 4–WAY FLOW



TYPICAL 3–WAY FLOW

TYPICAL CHANNELIZATION DETAILS
FOR SANITARY SEWERS

d = 1.1 x pipe diameter



* MINIMUM 0.1
FALL THROUGH
MANHOLE

TYPICAL CROSS SECTION

MANHOLE CHANNELIZATION

STANDARD DRAWING NO. GM–04–01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.

NEW ALBANY 24" MANHOLE COVER

J.R. HOE AND SONS

www.jrhoe.com 800-245-5521

Material Specs: ASTM A48 Class 35B, Gray Iron

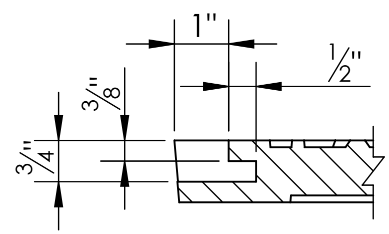
Cover Weight: 110 lbs

Drawing Date: 8-29-2017 **By:** BJC
Revision Date: **By:**

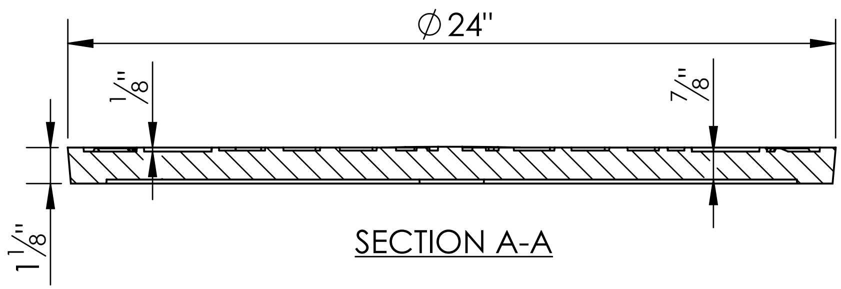
LEED: Gray iron castings are eligible for LEED credits under sections MR4 Recycled Content and MR5 Regional Materials

OPTIONS:

TOP VIEW



CONCEALED PICKHOLE DETAIL

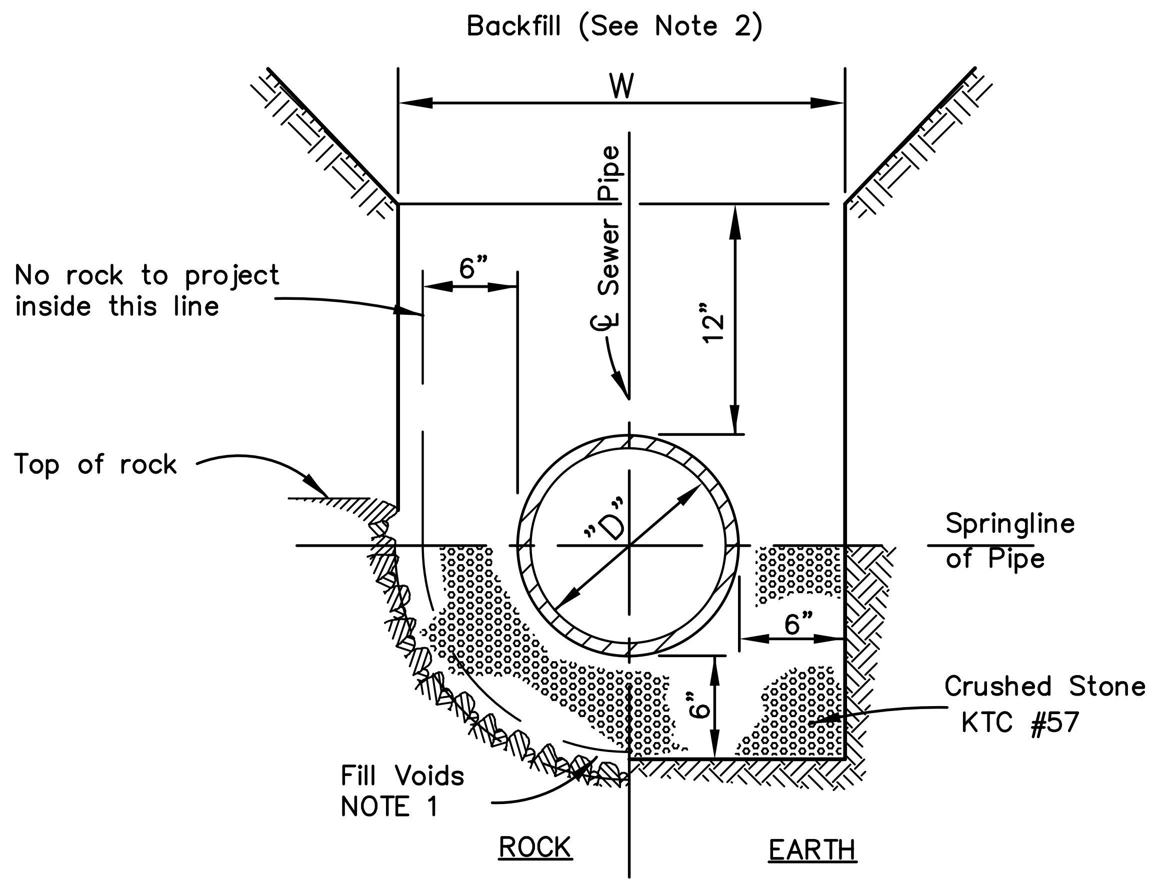


SECTION A-A

MANHOLE LID
JULY 2020

Maximum Allowable Trench Width 12" Above Outside Top of Pipe "W"	Inside Diameter of Pipe "D"
2'–6"	4"
2'–8"	6"
2'–10"	8"
3'–0"	10"
3'–5"	12"
3'–9"	15"
4'–1"	18"
4'–4"	21"
4'–8"	24"
5'–1"	27"
5'–5"	30"
5'–10"	33"
6'–2"	36"
6'–8"	39"
6'–11"	42"
7'–6"	48"
D+2t+2'-8"	over 48"

If "W" is exceeded, a Concrete Cradle shall be placed at such locations at the Contractor's expense. Applies to excavations in rock or earth.



NOTES:

1. All rock loosened shall be removed; voids created by such removal shall be refilled with Crushed Stone KTC #57.
2. Backfill shall be as noted on the drawings.
3. Remove stone for pipe bells to provide full contact of bedding.

CRUSHED STONE CRADLE

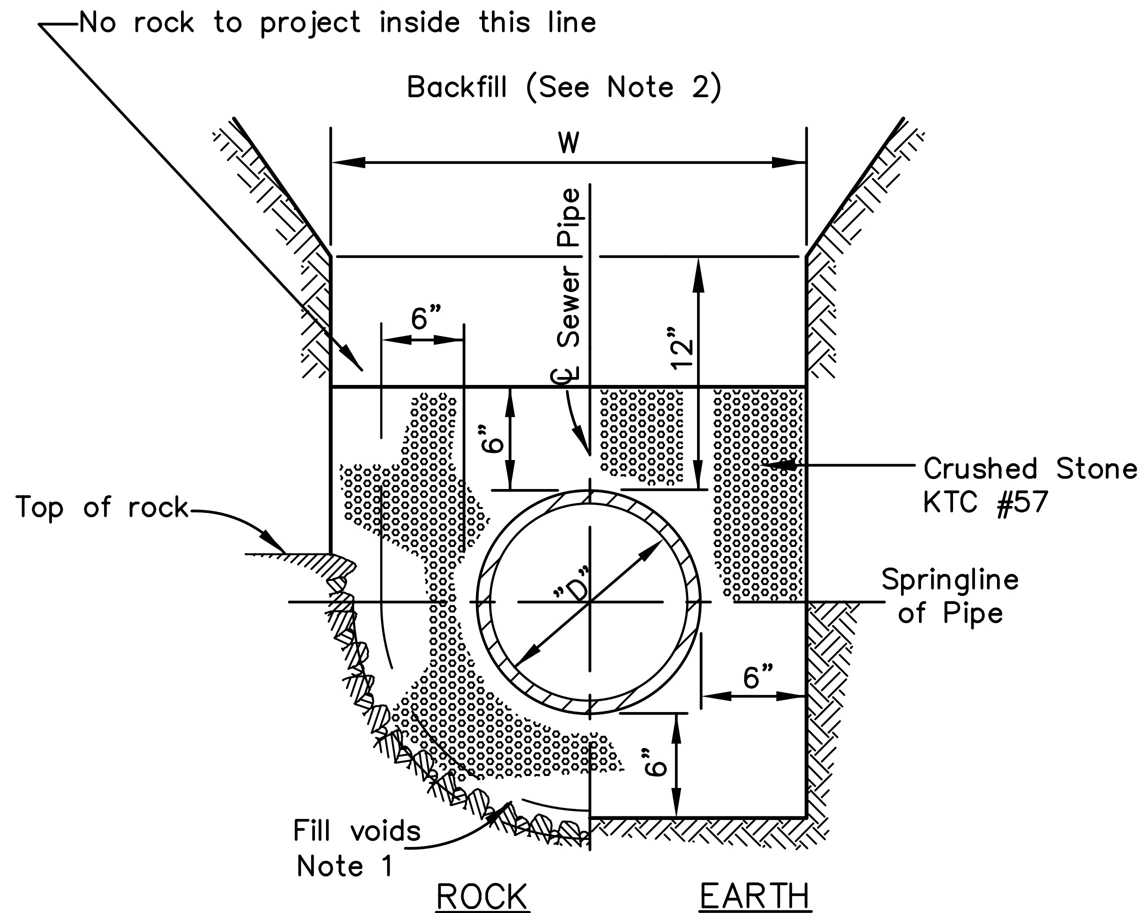
STANDARD DRAWING NO. GC–01–01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.

Maximum Allowable Trench Width 12" Above Outside Top of Pipe "W"	Inside Diameter of Pipe "D"
2'–6"	4"
2'–8"	6"
2'–10"	8"
3'–0"	10"
3'–5"	12"
3'–9"	15"
4'–1"	18"
4'–4"	21"
4'–8"	24"
5'–1"	27"
5'–5"	30"
5'–10"	33"
6'–2"	36"
6'–8"	39"
6'–11"	42"
7'–6"	48"
D+2t+2'-8"	over 48"

If "W" is exceeded, a Concrete Cradle shall be placed at such locations at the Contractor's expense. Applies to excavations in rock or earth.



NOTES:

1. All rock loosened shall be removed; voids created by such removal shall be refilled with Crushed STone KTC #57.
2. Backfill shall ne noted on the drawings.
3. Remove stone for pipe bells to provide full contact of bedding.

CRUSHED STONE ENCASEMENT

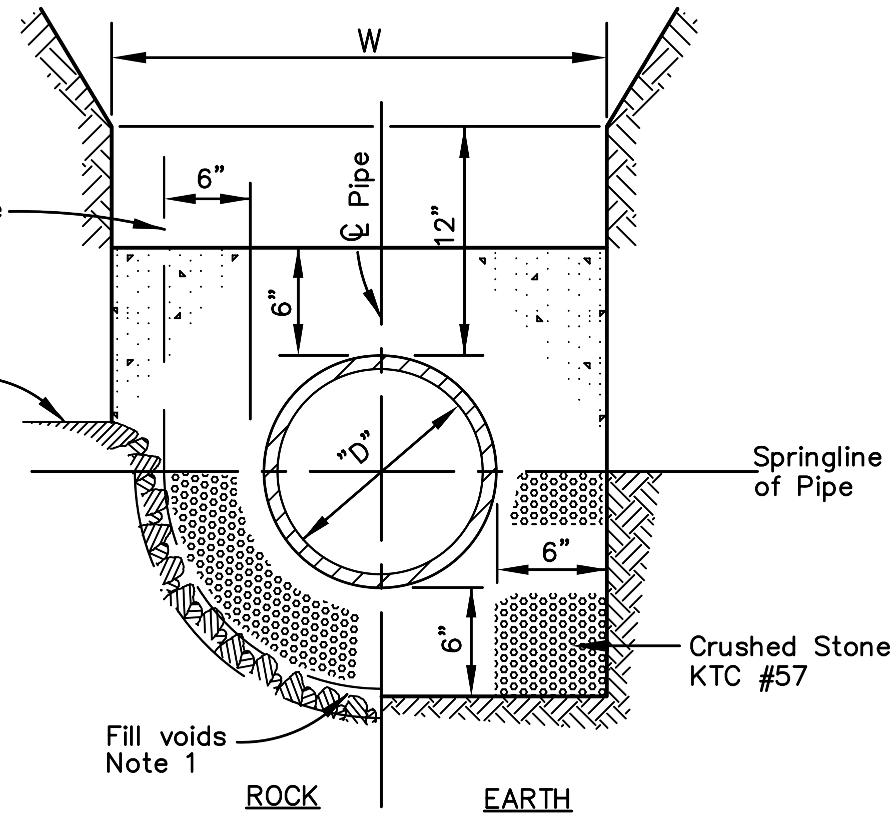
STANDARD DRAWING NO. GC–02–01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.

Maximum Allowable Trench Width 12" Above Outside Top of Pipe "W"	Inside Diameter of Pipe "D"
2'-6"	4"
2'-8"	6"
2'-10"	8"
3'-0"	10"
3'-5"	12"
3'-9"	15"
4'-1"	18"
4'-4"	21"
4'-8"	24"
5'-1"	27"
5'-5"	30"
5'-10"	33"
6'-2"	36"
6'-8"	39"
6'-11"	42"
7'-6"	48"
D+2t+ 2'-8"	over 48"

If "W" is exceeded, a Concrete Cradle shall be placed at such locations at the Contractor's expense. Applies to excavations in rock or earth.



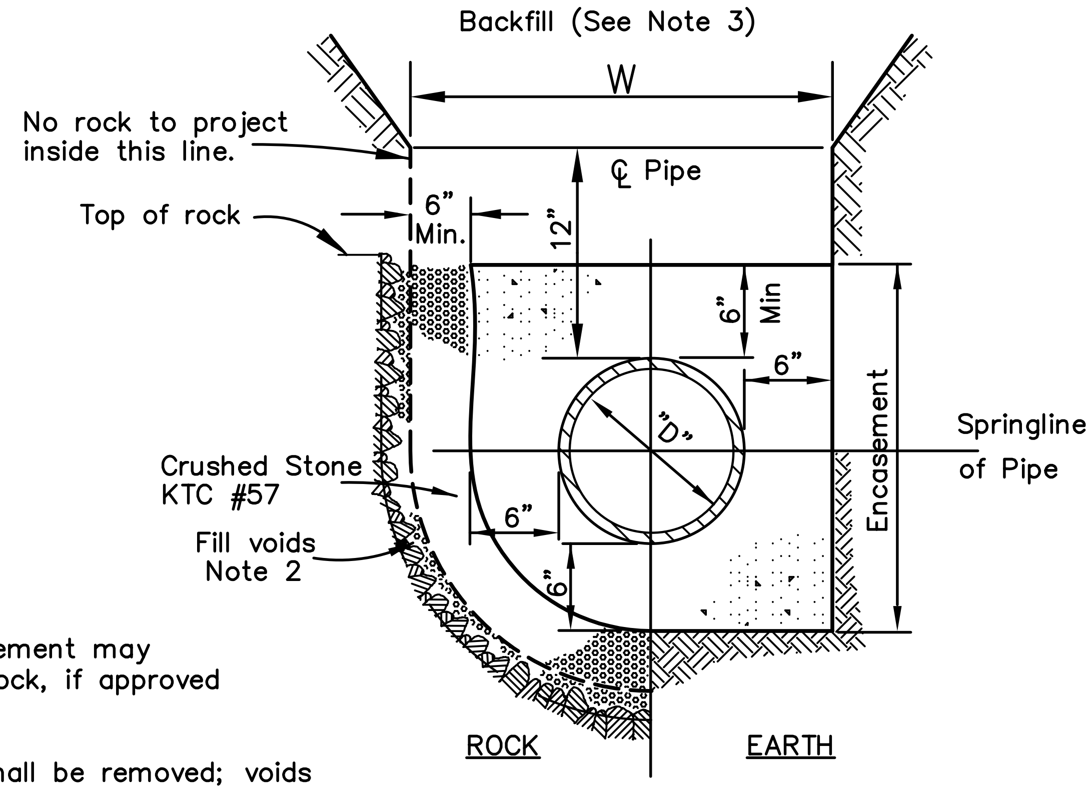
NOTES:

1. All rock loosened shall be removed; voids created by such removal shall be refilled with Crushed Stone KTC #57.
2. If concrete is placed against sheeting, tarred or other suitable paper shall be first attached to the sheeting. The sheeting will not be allowed to be removed until the concrete has sufficiently cured.
3. The concrete cap may be placed against rock, if approved by the engineer.
4. Class "B" concrete shall be used.
5. Backfill shall be as noted on the drawing.
6. Remove stone for pipe bells to provide full contact of bedding.

CONCRETE CAP	
STANDARD DRAWING NO.	GC-03-01
DECEMBER 2012	

*This is a detail from MSD Standard Drawings dated 9-30-09.

Maximum Allowable Trench Width 12" Above Outside Top of Pipe "W"	Inside Diameter of Pipe "D"
2'–6"	4"
2'–8"	6"
2'–10"	8"
3'–0"	10"
3'–5"	12"
3'–9"	15"
4'–1"	18"
4'–4"	21"
4'–8"	24"
5'–1"	27"
5'–5"	30"
5'–10"	33"
6'–2"	36"
6'–8"	39"
6'–11"	42"
7'–6"	48"
D+2t+ 2'-8"	over 48"



NOTES:

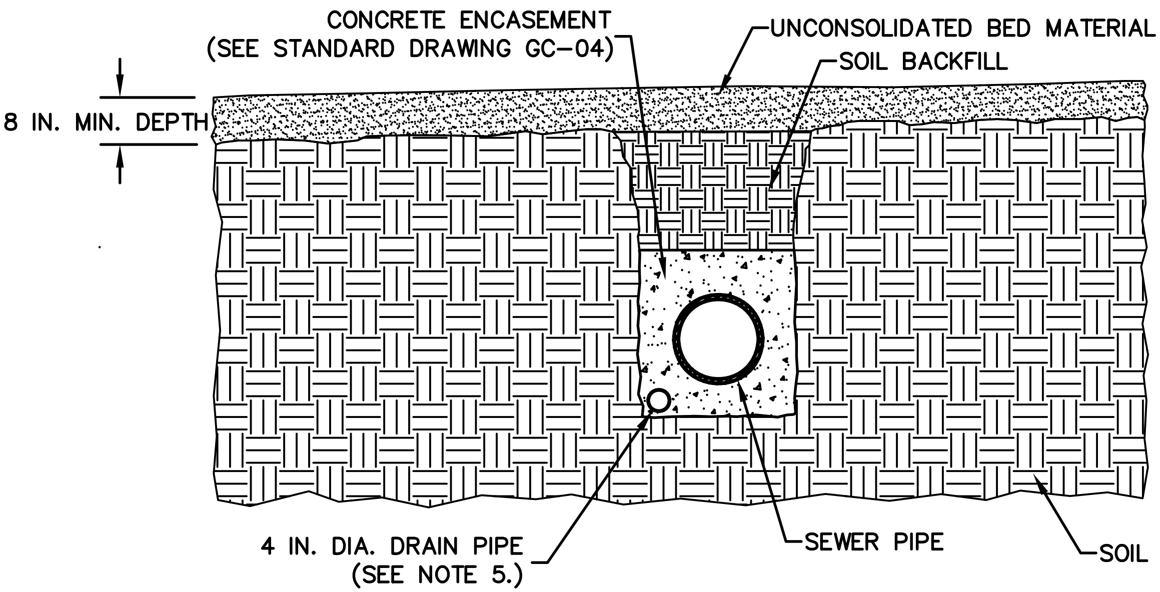
1. The concrete encasement may be placed against rock, if approved by the engineer.
2. All rock loosened shall be removed; voids created by such removal shall be filled with Crushed Stone KTC #57.
3. Backfill shall be as noted on the drawings.
4. Contractor shall encase pipe a minimum of 6–inches above the pipe or to existing rock line, as shown on drawings.
5. Contractor shall keep pipe from floating during the placement of concrete.
6. If concrete is placed against sheeting, tarred or other suitable paper shall be first attached to the sheeting. The sheeting will not be allowed to be removed until the concrete has sufficiently cured.
7. Class "B" concrete shall be used.

CONCRETE ENCASEMENT

STANDARD DRAWING NO. GC–04–01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.



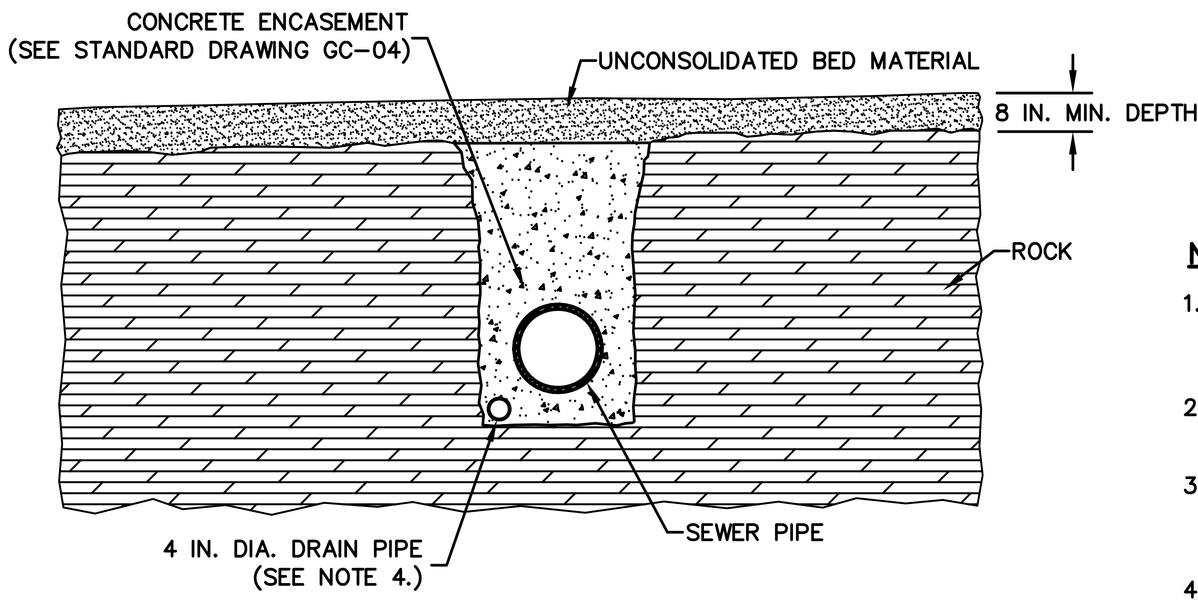
CROSS SECTION

NOTES

1. UNCONSOLIDATED MATERIAL IS LOOSE STONE, GRAVEL, SAND, SOIL, OR MUCK NATURALLY DEPOSITED IN THE STREAM BED.
2. STOCKPILE BED MATERIAL AND SOIL IN SEPARATE STOCKPILES.
3. SOIL BACKFILL AND UNCONSOLIDATED BED MATERIAL SHALL BE SAME MATERIAL AS THAT REMOVED DURING EXCAVATION.
4. SOIL BACKFILL SHALL BE COMPACTED TO 95% OF STANDARD PROCTOR DENSITY.
5. EXTEND EACH END OF DRAIN PIPE TO A MINIMUM OF 24 INCHES INTO CRUSHED STONE ENCASEMENT.
6. 4" DRAIN IS OPTIONAL BASED ON SITE CONDITIONS.

RESTORATION OF CHANNELS WITH UNCONSOLIDATED BEDS OVER SOIL	
STANDARD DRAWING NO.	EC-01-01
DECEMBER 2012	

*This is a detail from MSD Standard Drawings dated 9-30-09.



CROSS SECTION

NOTES

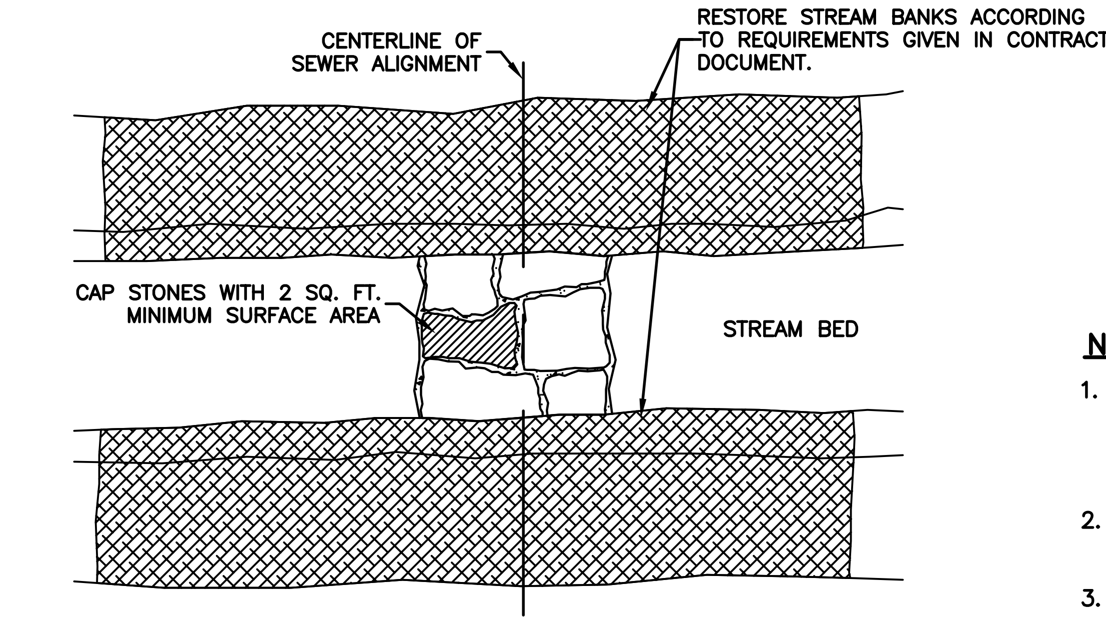
1. UNCONSOLIDATED MATERIAL IS LOOSE STONE, GRAVEL, SAND, SOIL, OR MUCK NATURALLY DEPOSITED IN THE STREAM BED.
2. STOCKPILE BED MATERIAL SEPARATE FROM SPOIL MATERIAL.
3. UNCONSOLIDATED BED MATERIAL SHALL BE SAME MATERIAL AS THAT REMOVED DURING EXCAVATION.
4. EXTEND EACH END OF DRAIN PIPE TO A MINIMUM OF 24 INCHES INTO CRUSHED STONE ENCASEMENT.
5. 4" DRAIN IS OPTIONAL BASED ON SITE CONDITIONS.

RESTORATION OF CHANNELS WITH UNCONSOLIDATED BEDS OVER ROCK

STANDARD DRAWING NO. EC-02-01

DECEMBER 2012

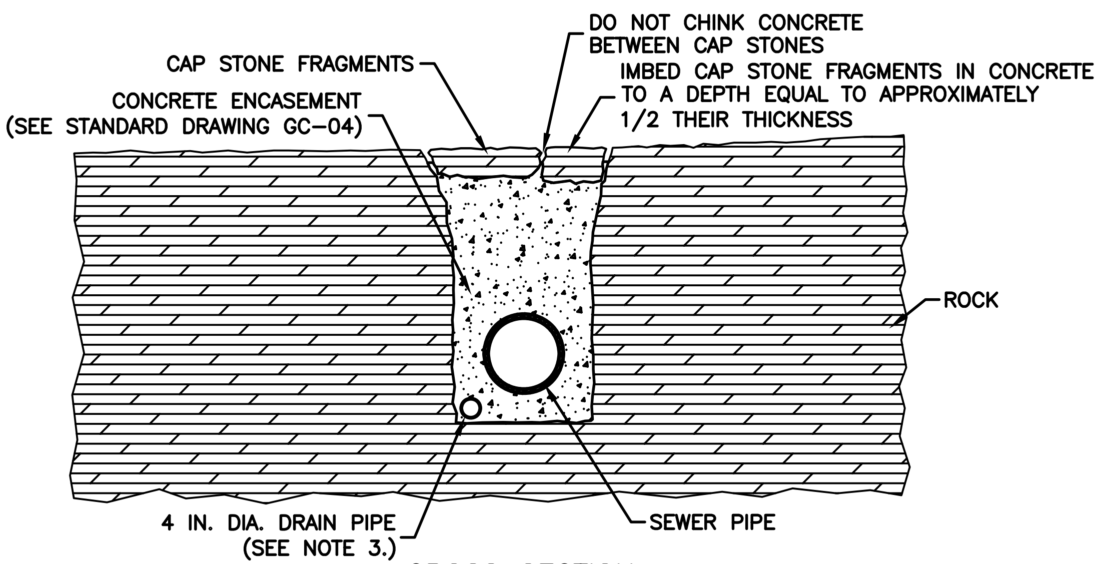
*This is a detail from MSD Standard Drawings dated 9-30-09.



PLAN

NOTES

1. USE THIS RESTORATION METHOD ON EXPOSED MONOLITHIC ROCK BEDS AND THOSE WITH LESS THAN 4 INCHES OF UNCONSOLIDATED BED MATERIAL DEPOSITED OVER A MONOLITHIC ROCK BED.
2. MINIMUM THICKNESS OF CAP STONE SHALL BE 8 INCHES.
3. EXTEND EACH END OF DRAIN PIPE A MINIMUM OF 24 INCHES INTO CRUSHED STONE ENCASEMENT.
4. 4" DRAIN IS OPTIONAL BASED ON SITE CONDITIONS.



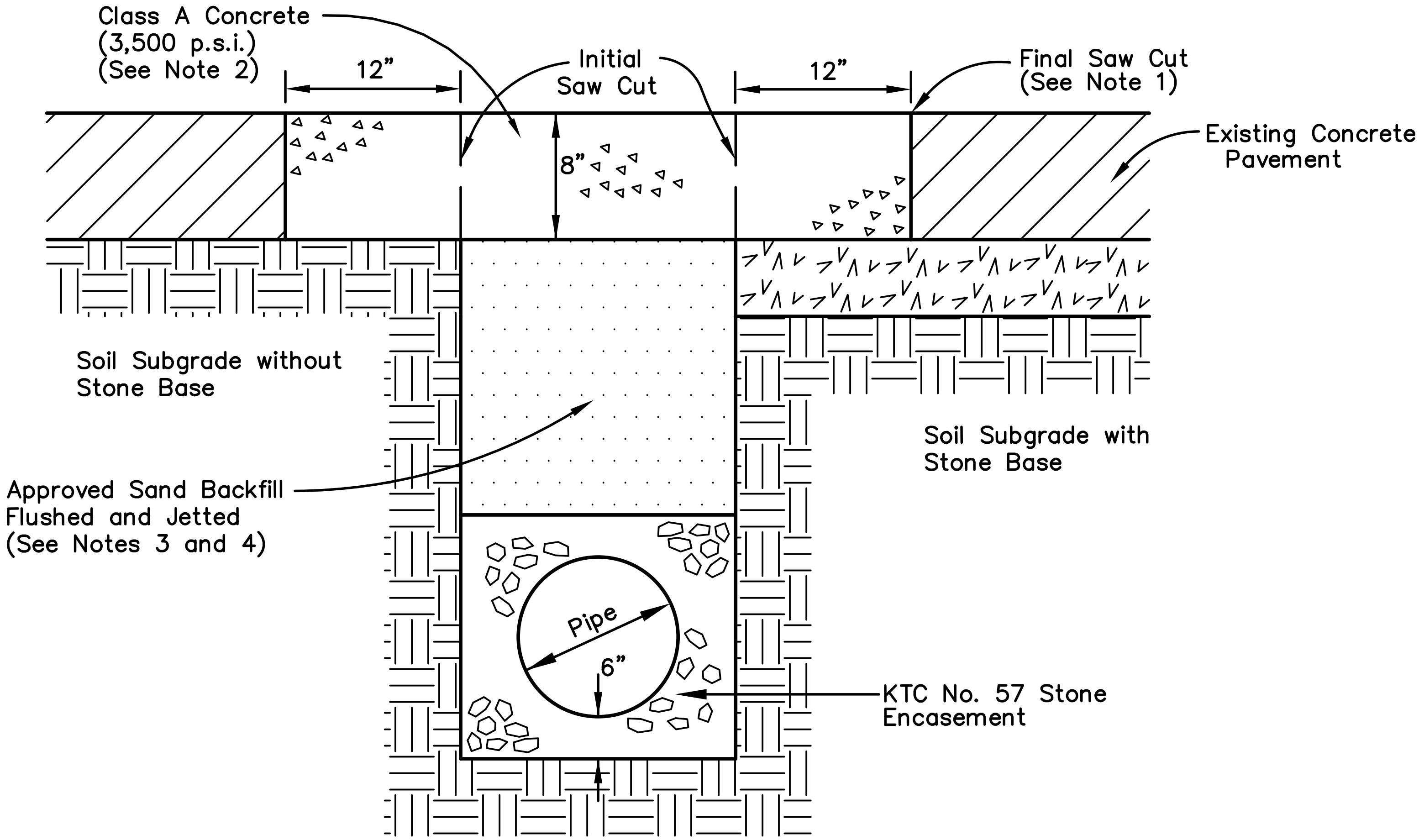
CROSS SECTION

RESTORATION OF CHANNELS WITH ROCK BED

STANDARD DRAWING NO. EC-03-01

DECEMBER 2012

*This is a detail from MSD Standard Drawings dated 9-30-09.

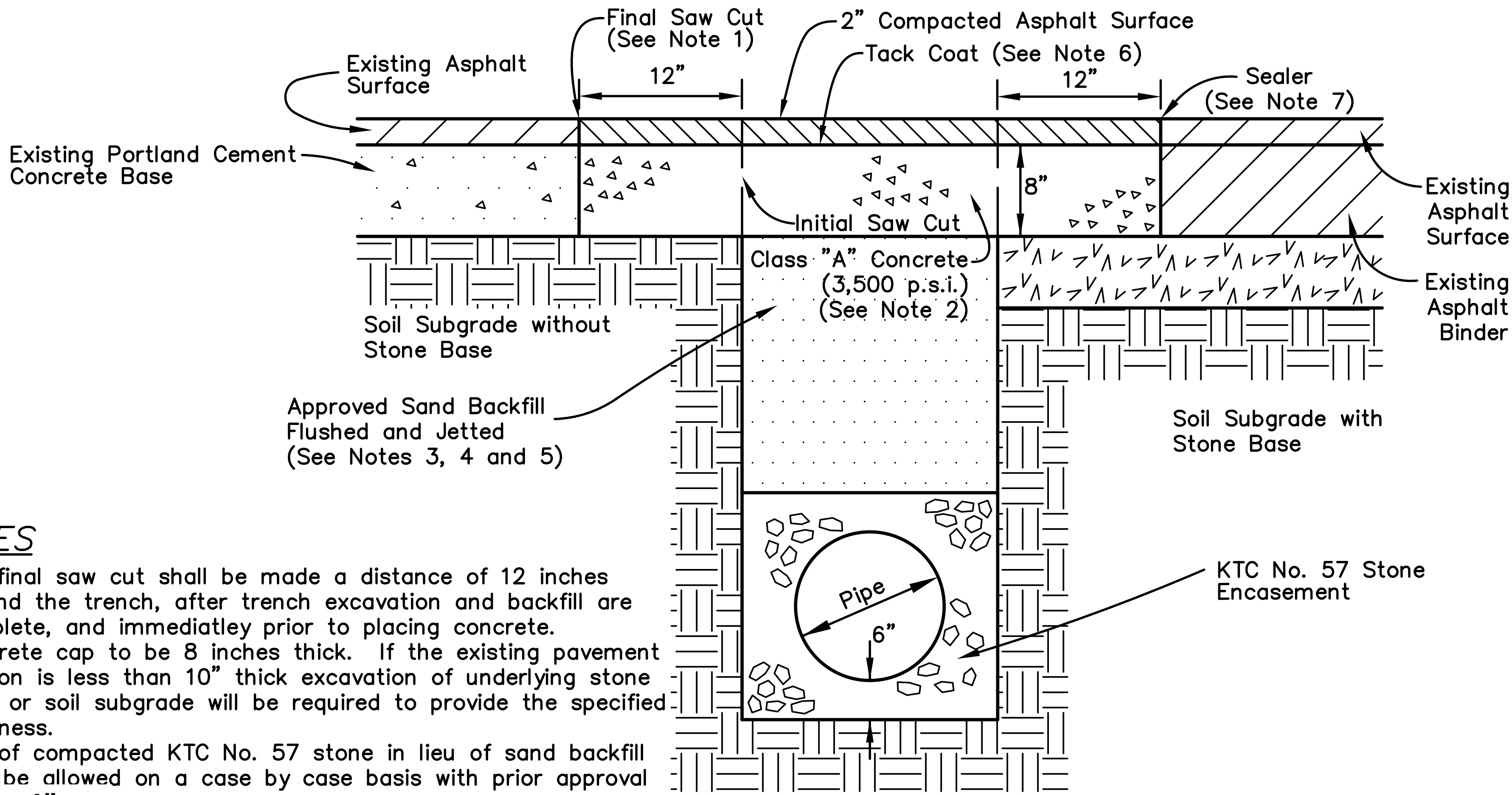


NOTES

1. The final saw cut shall be made a distance of 12 inches beyond the trench, after trench excavation and backfill are complete, and immediately prior to placing concrete. If the distance from the edge of the trench to an existing break or joint is less than 4 feet, the final saw cut shall be located at the existing break or joint.
2. Concrete cap to be 8 inches. If the existing pavement section is less than 8 inches thick, excavation of underlying stone base or soil subgrade will be required to provide the specified thickness.
3. Use of compacted KTC No. 57 stone in lieu of sand backfill may be allowed on a case by case basis with prior approval from **New Albany.**
4. In roadway embankment situations when sand backfill is utilized, compacted earth shall be placed in this zone within 5 feet (horizontal distance) of the embankment slope.
5. The Contractor shall be responsible during the ensuing 5 years for proper backfilling and replacement of the surface. During the 5 year period any pavement settlement shall be immediately repaired by the Contractor at the expense of the Contractor.

NEW ALBANY	
CONCRETE PAVEMENT RESTORATION	
STANDARD DRAWING NO.	PR–01–01
APRIL 2015	

*This is a detail from MSD Standard Drawings dated 9-30-09.

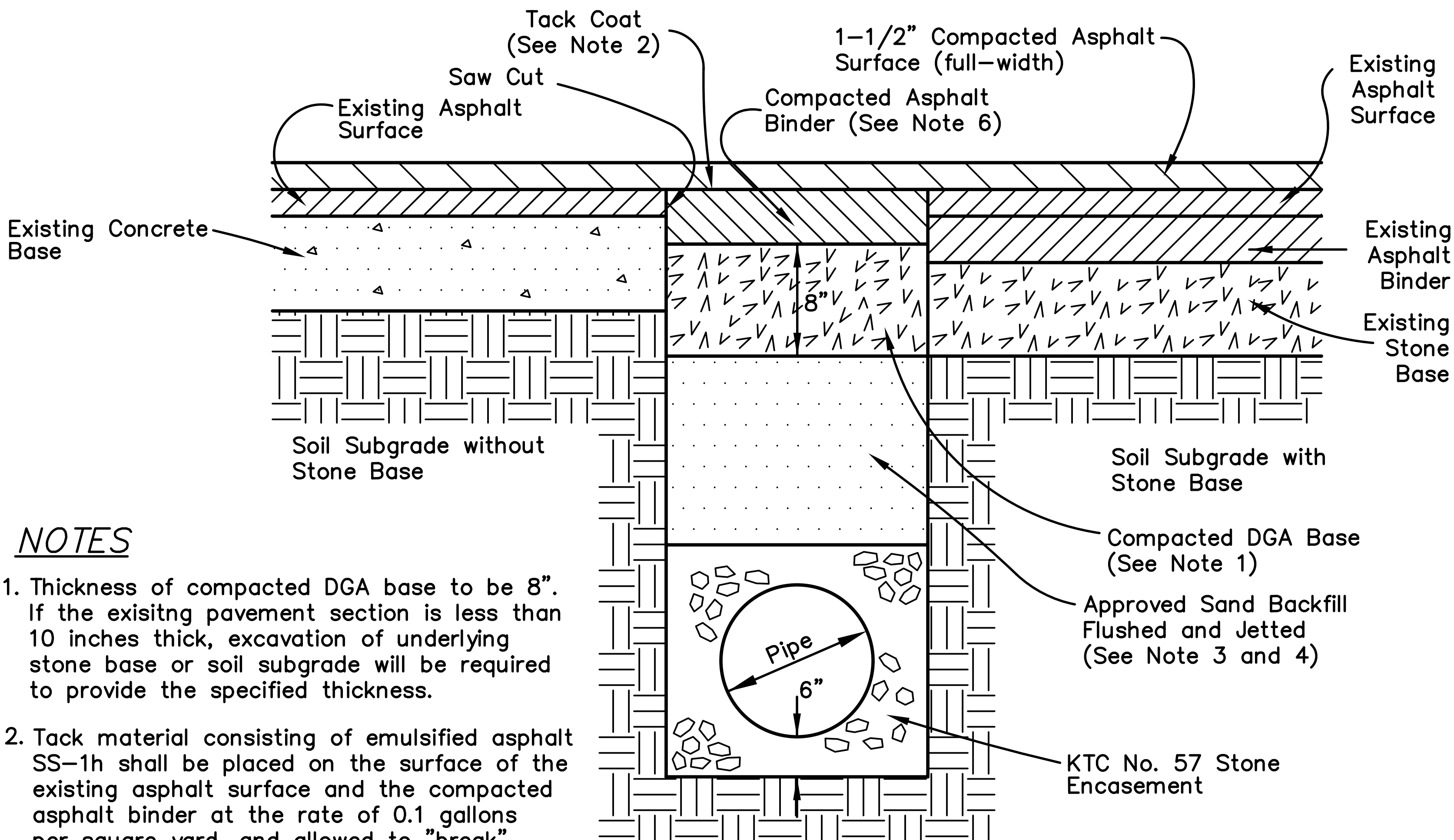


NOTES

1. The final saw cut shall be made a distance of 12 inches beyond the trench, after trench excavation and backfill are complete, and immediatley prior to placing concrete.
2. Concrete cap to be 8 inches thick. If the existing pavement section is less than 10" thick excavation of underlying stone base or soil subgrade will be required to provide the specified thickness.
3. Use of compacted KTC No. 57 stone in lieu of sand backfill may be allowed on a case by case basis with prior approval of **New Albany.**
4. **Use of processed coal bottom ash that meets the requirements for Type 1A backfill, as described in the New Albany and Floyd County Sanitary Sewer and Stormwater Design Manual, in lieu of sand may be allowed on a case by case basis with prior approval of New Albany.**
5. In roadway embankment situations, when sand backfill is utilized, compacted earth shall be placed in this zone within 5 feet (horizontal distance) of the embankment slope.
6. Tack material consisting of emulsified asphalt SS−1h shall be placed on the surface of the concrete cap at the rate of 0.1 gallon per square yard, and allowed to "break" prior to the placement of the asphalt surface.
7. Pavement joints shall be sealed with an approved joint sealant after placement of asphalt surface.
8. The Contractor shall be responsible during the ensuing 5 years for proper backfilling and replacement of the surface. During the 5 year period any pavement settlement shall be immediately repaired by the Contractor at the expense of the Contractor.

NEW ALBANY
ASPHALT PAVEMENT RESTORATION
STANDARD DRAWING NO. PR−02−02
APRIL 2015

*This is a detail from MSD Standard Drawings dated 9-30-09.



NOTES

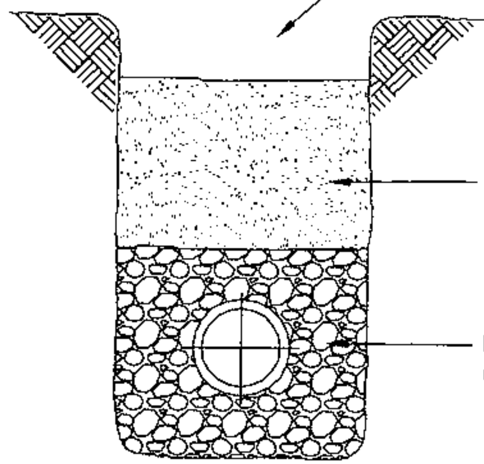
1. Thickness of compacted DGA base to be 8". If the exisitng pavement section is less than 10 inches thick, excavation of underlying stone base or soil subgrade will be required to provide the specified thickness.

2. Tack material consisting of emulsified asphalt SS-1h shall be placed on the surface of the existing asphalt surface and the compacted asphalt binder at the rate of 0.1 gallons per square yard, and allowed to "break" prior to placement of the full width asphalt surface.

3. Use of compacted KTC No. 57 stone in lieu of sand backfill may be allowed on a case by case basis with prior approval of **New Albany.**
4. Use of processed coal bottom ash that meets the requirements for Type 1A backfill, as **described in the New Albany and Floyd County Sanitary Sewer and Stormwater Design Manual, in lieu of sand may be allowed on a case by case basis with prior approval of New Albany.**
5. The Contractor shall be responsible during the ensuing 5 years for proper backfilling and replacement of the surface. During the 5 year period any pavement settlement shall be immediately repaired by the Contractor at the expense of the Contractor.
6. Use 2 inch thick binder on Subdivision streets.

NEW ALBANY	
ASPHALT PAVEMENT RESTORATION WITH OVERLAY	
STANDARD DRAWING NO.	PR-03-02
APRIL 2015	

*This is a detail from MSD Standard Drawings dated 9-30-09.



TYPE I-A BACKFILL
SAND FLUSHED & JETTED
WITHIN LIMITS OF EXISTING OR PROPOSED PAVED SURFACES

NOT TO SCALE

NOTES:

1. WATER TO BE USED FOR FLUSHING AND JETTING SHALL BE SUPPLIED THROUGH HOSES AND PIPES HAVING MINIMUM DIAMETER OF 2 INCHES. THE JET PIPE SHALL HAVE A MINIMUM DIAMETER OF 1.5 INCHES.

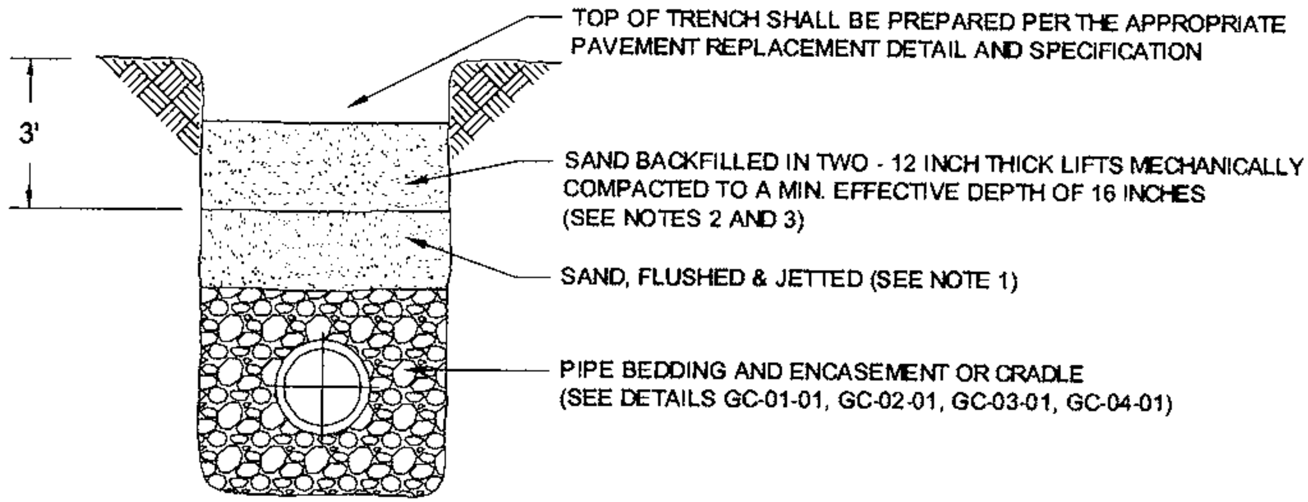
2. THE JET PIPE SHALL BE INSERTED INTO THE SAND BACKFILL BEGINNING AT THE DOWNSTREAM END OF THE TRENCH AND PROCEEDING UPSTREAM AT A MAXIMUM SPACING ALONG THE TRENCH OF 6 FEET AND THE SPACING SHALL BE STAGGERED ALONG THE TRENCH AREA.

3. THE JET PIPE SHALL PENETRATE THE SAND BACKFILL TO WITHIN 12 INCHES OF THE CRUSHED STONE ENCASEMENT.

4. THE PIPE SHALL REMAIN IN PLACE UNTIL WATER IS OBSERVED RISING ABOVE THE BACKFILL THROUGHOUT THE FULL WIDTH OF THE TRENCH AND OVER A LENGTH OF TRENCH EQUAL TO ONE HALF THE DISTANCE BETWEEN ADJACENT JET INSTALLATIONS.

5. FOLLOWING FLUSHING AND JETTING AND PRIOR TO PAVEMENT CONSTRUCTION, THE SURFACE OF THE SAND SUBGRADE SHALL BE THOROUGHLY COMPACTED FOLLOWING THE PROCEDURES DESCRIBED IN THE TYPE I-B BACKFILL DETAIL.

TYPE I–A BACKFILL	
STANDARD DRAWING NO.	NA–I–A
APRIL 2015	



TYPE I-B BACKFILL
SAND FLUSHED & JETTED AND MECHANICALLY COMPACTED WITHIN LIMITS OF EXISTING OR PROPOSED PAVED SURFACES

NOT TO SCALE

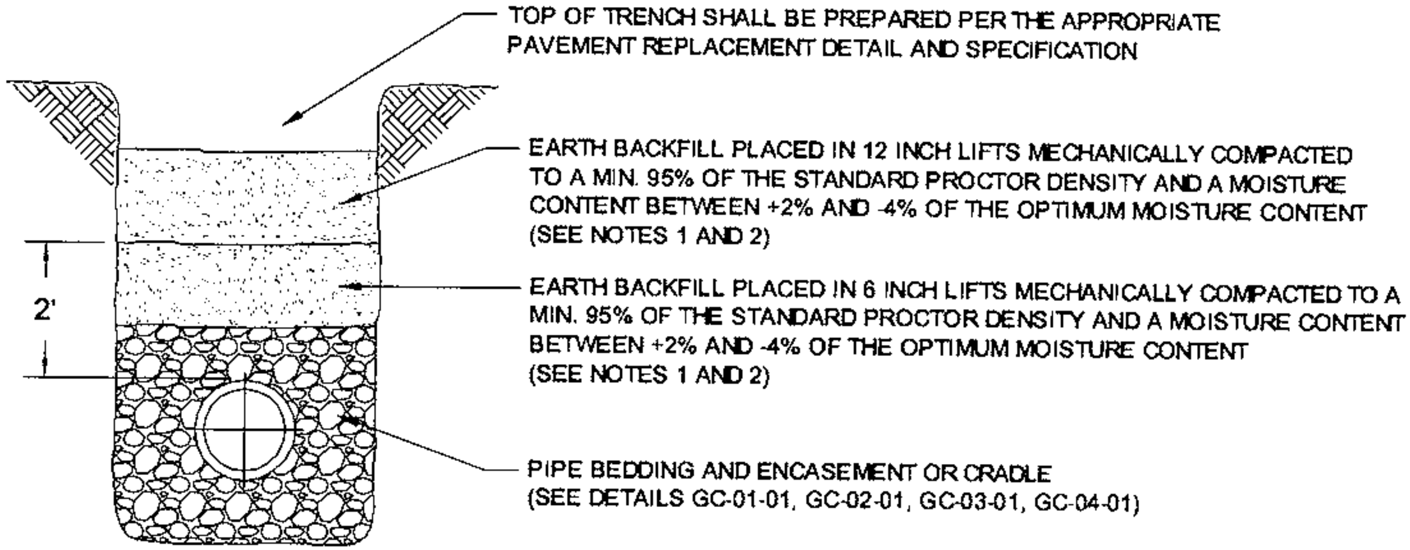
NOTES:

1. TRENCH SHALL BE COMPLETELY BACKFILLED WITH SAND AND DENSIFIED BY FLUSHING AND JETTING WITH WATER. FLUSHING AND JETTING PROCEDURES SHALL BE AS DESCRIBED IN THE TYPE I-A BACKFILL DETAIL. THE SAND BACKFILL SHALL BE REMOVED TO A DEPTH OF 3 FEET BELOW THE PAVEMENT SURFACE AND STOCKPILED FOR LATER MECHANICAL COMPACTION. THE EXPOSED SURFACE SHALL THEN BE THOROUGHLY COMPACTED.

2. FOR COMPACTION, THE CONTRACTOR SHALL SUPPLY A VIBRATORY PLATE COMPACTOR OR SMOOTH DRUM VIBRATORY ROLLER CAPABLE OF COMPACTING SANDS TO A MINIMUM EFFECTIVE DEPTH OF 16 INCHES.

3. THE REQUIRED NUMBER OF PASSES OF THE ROLLER OR PLATE SHALL BE ESTABLISHED AT THE BEGINNING OF COMPACTION OPERATIONS FOR THE PROJECT BY TAKING NUCLEAR DENSITY TESTS TO MONITOR THE DENSITY INCREASE WITH INCREASED PASSES OF THE ROLLER OR PLATE. THE REQUIRED NUMBER OF PASSES SHALL BE SET WHEN NO FURTHER INCREASE IN SAND BACKFILL DENSITY IS MEASURED.

TYPE I–B BACKFILL	
STANDARD DRAWING NO.	NA–I–B
APRIL 2015	



TYPE III-A BACKFILL
EARTH MATERIAL MECHANICALLY COMPACTED
WITHIN LIMITS OF EXISTING OR PROPOSED PAVED SURFACES

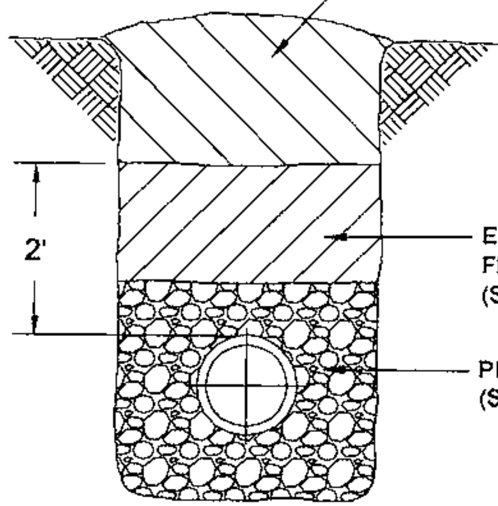
NOT TO SCALE

NOTES:

1. EARTH BACKFILL SHALL CONSIST OF SELECTED EXCAVATED MATERIALS OR APPROVED BORROW MATERIALS CONTAINING NO ROCK FRAGMENTS WITH A MAXIMUM DIMENSION LARGER THAN 4 INCHES.

2. EACH LAYER SHALL BE PROPERLY COMPACTED BEFORE THE NEXT SUCCEEDING LAYER IS PLACED. ANY LIFT OF FILL WHICH PUMPS UNDER WEIGHT OF THE COMPACTION EQUIPMENT SHALL BE REJECTED, REGARDLESS OF THE FIELD DENSITY TEST RESULTS.

TYPE III–A BACKFILL	
STANDARD DRAWING NO.	NA–III–A
APRIL 2015	



TYPE II BACKFILL
EARTH MATERIAL FLUSHED & JETTED
OUTSIDE LIMITS OF EXISTING OR PROPOSED PAVED SURFACES

NOT TO SCALE

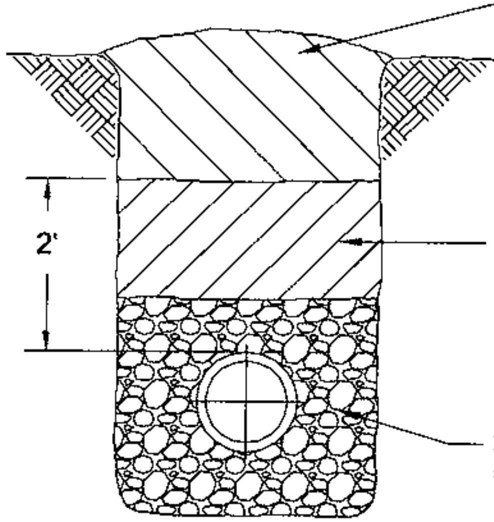
NOTES:

1. AFTER THE TRENCH HAS BEEN COMPLETELY BACKFILLED WITH SELECTED EXCAVATED MATERIALS OR APPROVED BORROW MATERIALS, THE BACKFILL SHALL BE DENSIFIED BY FLUSHING AND JETTING WITH WATER BEGINNING AT THE DOWNSTREAM END OF THE TRENCH AND PROCEEDING UPSTREAM. FLUSHING AND JETTING PROCEDURES SHALL BE AS DESCRIBED IN THE TYPE I-A BACKFILL DETAIL.

2. FLUSHING AND JETTING SHALL STOP ONCE THE BACKFILL IS COMPLETELY SATURATED AND NO FURTHER SETTLEMENT IS OBSERVED.

3. AFTER THE BACKFILL IN THE TRENCH HAS SUBSTANTIALLY DRIED AND COMPLETED ANY ADDITIONAL SETTLEMENT, ANY SETTLEMENT BELOW THE FINISH GRADE SHALL BE BACKFILLED WITH ADDITIONAL EARTH AND COMPACTED IN ACCORDANCE WITH TYPE III-B BACKFILL.

TYPE II BACKFILL	
STANDARD DRAWING NO.	NA-II
APRIL 2015	



TYPE III-B BACKFILL
EARTH MATERIAL MECHANICALLY COMPACTED
OUTSIDE LIMITS OF EXISTING OR PROPOSED PAVED SURFACES

NOT TO SCALE

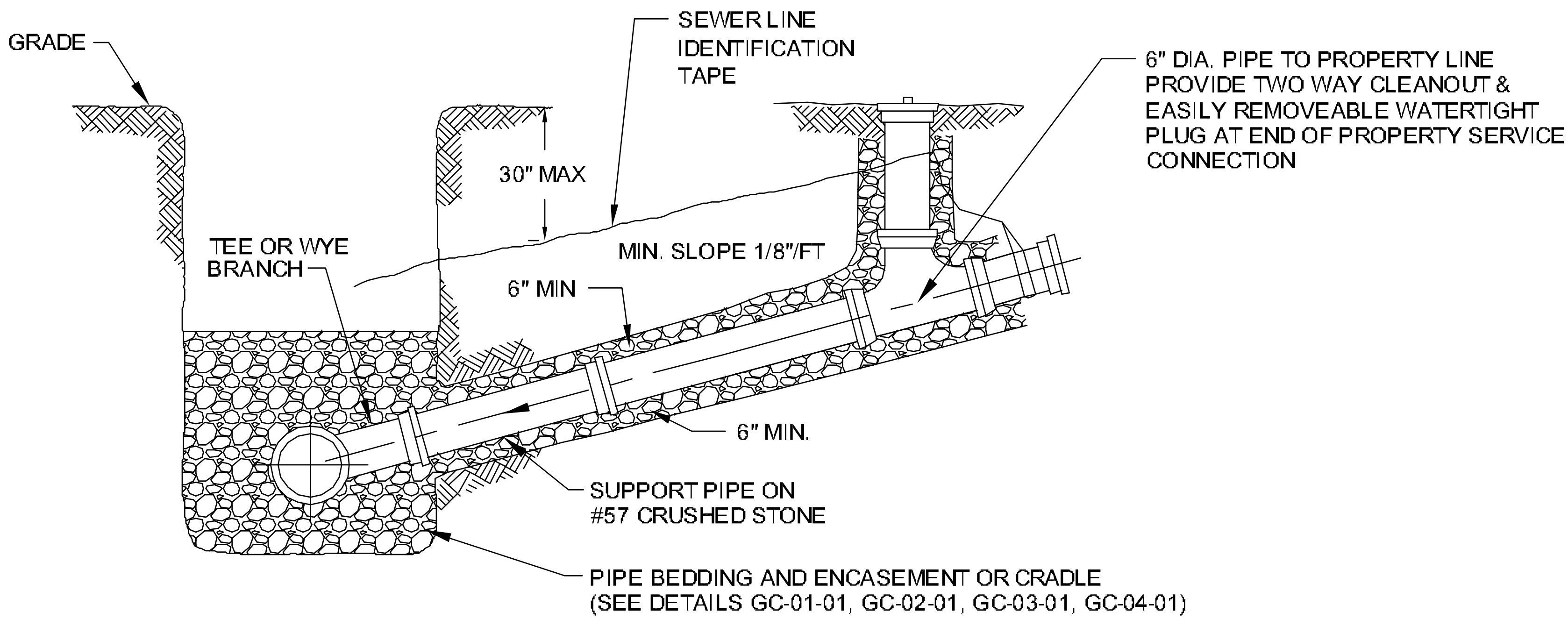
NOTES:

1. EARTH BACKFILL SHALL CONSIST OF SELECTED EXCAVATED MATERIALS OR APPROVED BORROW MATERIALS CONTAINING NO ROCK FRAGMENTS GREATER THAN THE DIMENSIONS LISTED ABOVE.

2. EACH LAYER SHALL BE THOROUGHLY COMPACTED BEFORE THE NEXT SUCCEEDING LAYER IS PLACED. ANY LIFT OF FILL WHICH PUMPS UNDER THE WEIGHT OF THE COMPACTION EQUIPMENT SHALL BE REJECTED, REGARDLESS OF THE FIELD DENSITY TEST RESULTS.

3. EACH LAYER SHALL BE COMPACTED WITH A DOZER OR OTHER HEAVY, EARTH-MOVING EQUIPMENT TRAVELING BACK AND FORTH OVER THE MATERIAL UNTIL NO FURTHER SETTLEMENT IS OBSERVED.

TYPE III–B BACKFILL	
STANDARD DRAWING NO.	NA–III–B
APRIL 2015	



NOTE:
1. THIS DETAIL IS FOR SHALLOW PROPERTY SERVICE CONNECTIONS IN ROCK OR EARTHEN TRENCH.

PROPERTY SERVICE CONNECTION FOR SHALLOW SEWER

STANDARD DRAWING NO. NA–SPSC

APRIL 2015

Appendix B

Criteria for Precast Structures

APPENDIX B

CRITERIA FOR PRECAST STRUCTURES

1. Any use of precast structures must be so noted on the plans, including a typical detail for each type of structure for the project.

2. Structures which require specially designed footings, cut-off walls, etc., will not be allowed as precast.

3. Openings in precast structures for pipes shall be the outside diameter of the pipe plus maximum of 6 inches. In order to use non-shrink grout, the opening shall be the outside diameter of pipe plus 3 inches. (Outside diameter of pipe plus 4 1/2 inches is permissible when tapered hole forms are utilized.)

4. For precast structures (other than those with knockout panels), the opening around the pipe shall either be filled with non-shrink grout for the wall thickness of the structure or the pipe shall be encased with a minimum 6-inch collar of concrete from the inside face of the wall to 1'-0" outside the outer face of the wall. The pipe shall be adequately supported to prevent settling while the grout or the concrete encasement is setting up. The inside face of the structure walls shall be finished with a trowel and wet brush finish.

5. For circular structures, the following applies as to the maximum inside diameter (or horizontal dimension) of pipe to be used with a given size of manhole.

Diameter of Structure	Maximum Size of Pipe*
4'-0"	24 inches
5'-0"	36 inches
6'-0"	48 inches

*Outside diameter may be considered on a case-by-case basis for flexible pipe.

6. For circular structures, the minimum distance allowed between precast holes for the pipes shall be 12 inches.

7. For circular structures and rectangular structures (other than those with knockout panels), the minimum vertical distance from the holes for the pipes to the top of the structure wall shall be 4 inches. If this vertical distance is less than 12 inches, then additional reinforcing steel shall be furnished for this section. The top slab must be designed for HS-20 loading.

8. For precast structures with knockout panels, holes for the pipe shall not be cut into the structural members (i.e., top beams and corner columns) and non-shrink grout shall not be allowed to be placed around the pipes. The pipes shall be encased with concrete a minimum 6-inch collar around the outside of pipe or a minimum of 3 inches beyond the hole knocked in the wall, whichever is greater. Also, the concrete encasement shall extend from the inside face of the wall to 1'-0" outside the outer face of the wall.

9. Precast structures with knockout panels shall not be used with more than 2 feet of earth cover unless load calculations are supplied.

10. For rectangular structures where pipe will be installed in adjacent walls (other than those with knockout panels), at least 6 inches of wall (measured from the interior corner)is required on each side of the pipe beyond the precast opening for the pipe. This rule is not applicable for structures which have pipe installed in opposite walls or where one outlet pipe is utilized.

11. A wash is required in the bottom of catch basins to provide positive drainage (sloped toward outlet).

Appendix C

New Albany Lift Station Specifications

City of New Albany Sewer Utility

TECHNICAL SPECIFICATIONS FOR LIFT

STATIONS Revised 12-20-14

In addition to those recommended standards specified by the latest revision of the "Recommended Standards for Sewage Works" (Ten State Standards), the following minimum standards for wastewater lift station design and installation; have been adopted by the City of New Albany Sewer Utility.

All wastewater lift stations shall be of the submersible type. With prior approval, lift stations, with average minimum flow between 0.25 MGD and one (1) MGD, may be designed as wet well/dry pump pit type. Lift stations larger than one (1) MGD will require extensive pre-design discussions.

A. Submersible type wastewater lift station minimum specifications:

1. Wet Well

a. Circular wet well(s) shall be fabricated of pre-cast reinforced concrete base sections, riser sections, and flat slab tops. Base sections, riser sections, and flat slab tops shall conform to the requirements of ASTM Specifications C478, latest revision. Joints between pre-cast sections shall be sealed with two (2) rings of flexible butyl rubber sealant. Concrete wet wells shall be coated outside with an approved bituminous seal coating. Interior Joints shall be sealed with high strength non-shrink grout. All inlet and outlet pipes through the wet well wall shall be through a cast-in-place opening and provided with a resilient seal. Wet well top slab to be located above 100-year flood elevation or flood-proof hatch to be installed.

b. The wet well base shall be placed on at least twelve (12) inches of leveled and compacted KYDOT #57 crushed limestone.

c. The wet well access hatches shall have aluminum frames and doors with hinged double doors, locking provisions and self-opening shocks. The door shall be ¼" thick aluminum floor plate reinforced to 300 PSF live load. Hinges and all hardware shall be of stainless steel. Bumper blocks shall be placed to block vehicles from driving onto or across the wet well hatches. Access hatch drainage channel to be drained to daylight.

d. The wet well shall be designed large enough to allow at least twelve (12) minutes elapsed time between successive equipment starts during average flow conditions, and small enough to prevent the wastewater from going septic. Engineer shall submit all computations used to size wet well, including depth of wet well and to determine pump size(s).

e. Except as requested by the Utility, the wet well floor shall have a fillet at the inner base wall of the wet well to prevent the accumulation of solids.

f. Wet well shall have a minimum inside diameter of six (6) feet and a minimum depth of six (6) feet from the bottom to the invert of the lowest incoming pipe. In addition, the highest "alarm level" float shall be at least one (1) foot below the lowest incoming pipe and the lowest "pump off" float shall be set at the top of the pump for complete submersion of the pump. Floats shall be placed in a location that is readily accessible for pulling and cleaning needs.

g. Due to the six (6) feet depth, fall protection must be provided in way of OSHA approved anchor points of at least 2 or more.

h. A diverting shield or baffle may be required on the influent flow piping / made of stainless steel or an approved material.

2. Valve Vault

a. A rectangular valve vault shall be installed on the discharge piping for ease of accessibility and maintenance of the check and plug valves. It shall be designed so that no part of a valve or pipefitting flange is closer than twelve (12) inches to a wall, floor or ceiling to allow easy maintenance access. Valve vault top slab to be located above 100-year flood elevation or flood-proof hatch to be installed.

b. The valve vault shall be constructed in accordance with the specifications for wet well construction. The valve vault shall be a rectangular pre-cast or cast-in-place concrete structure with minimum inside diameter of 6' x 6'. The discharge piping shall be at least three (3) feet below finished grade of the area. The valve vault base shall be placed on at least six (6) inches of leveled and compacted KYDOT #57 crushed limestone. The valve vault shall not be placed on unstable (uncompacted) fill due to over-excavation of the lift station area. All inlet and exit piping through the wall of the valve vault shall be through cast-in-place openings provided with a resilient seal. A drainpipe shall be placed in the valve vault with the discharge end placed in the wet well. An approved backflow device shall be placed on the end of the drainpipe in the wet well.

c. The valve vault shall be coated on the outside with an approved bituminous seal coating.

d. A hinged single hatch with locking provisions, access hatch assembly shall be installed on the top of the valve vault. The hatch, frame, and accessories shall be constructed of aluminum with stainless steel hardware and fasteners, having a minimum opening of 30" X 30". The hatch shall be rated at 300 PSF live load. The hatch shall open away from the electrical control panel/junction box. Access hatch drainage channel to be drained to daylight.

3. Pumps, Motors and Seals

The following manufactures are preferred:

- Flygt
- Hydromatic

- Myers

Other manufacturers may be accepted on a case-by-case basis. All pump documentation shall be submitted for approval, prior to ordering equipment, to the City of New Albany / Wastewater Treatment Plant Manager.

4. Valves, Discharge Piping, and Force Main

a. Discharge piping shall be ductile iron pipe with flanged ductile iron fittings, and long radius elbows. Preferred (wye) after check valves to reduce friction loss.

b. Valves and piping shall be a minimum 4-inch in size. Piping shall be designed to minimize station head loss yet maintain the cleaning velocity of at least two (2) fps. All discharge piping shall be of the same size as the force main, (increase to this size at pump discharge).

c. A swing-type check valve and plug valve shall be installed in the discharge line of each pump and located in the valve vault. Plug valves shall conform to AWWA C504-80 and rated for 150 psi. Matco check valves shall conform to AWWA C1111, be rated at 150 psi, and shall have a spring-loaded external lever arm or weighted. The plug valves shall be Dezurik, eccentric type installed outlet side (after) the check valves. The connection of the piping after the valves will be made utilizing a wye connection. Design engineer shall include provision for a “slow-closing” check valve when conditions require such a valve.

d. An emergency pump auxiliary connection shall be provided on all lift stations. This connection will allow the bypass pumping of the wet well in emergency conditions. The pipe shall extend out of the ground one (1) foot to connect a pump hose. The connection end of the pipe shall be four (4) inch with a four (4) inch female cam lock fitting or quick connect unless the design horse power of the pump is above sixty (60) HP then a six (6) inch connection and female cam lock is required.

e. Ductile iron Class 51 and 52 pipe for use in force mains sized four (4) inches and larger shall be constructed per ANSI Specification A21-51-1976 covering thickness design of ductile iron pipe, and AWWA Specification C151-76 covering overall specifications and requirements for ductile iron pipe.

f. PVC C-900 Class 150 pipe for use in force mains four (4) inches and larger shall be constructed per AWWA Specification C-900-89. All PVC force mains shall be laid with a 12 gauge shielded copper tracing wire and tape placed on the top of the pipe. The wire must be accessible at the valve vault, discharge manhole, air relief valve manholes, and at access boxes when the distance between the above structures exceeds 1000 feet.

g. Force main fittings shall be 150 psi (minimum) ductile iron mechanical joints. Fittings and piping shall be restrained per AWWA specifications using Meg-a-lug restrainer glands and blocking.

h. Apco or Val-matic (Determined by City) automatically operating combination air and vacuum relief valves shall be placed at all high points on the force main. They shall be placed in minimum 48” diameter manholes for ease in access and maintenance. The air relief valves shall be of stainless steel construction or cast with stainless internal parts.

i. Force mains shall be hydrostatically tested for leakage at 150 % of maximum operating pressure.

j. Discharge piping to have stainless steel liquid filled gauges (P.S.I.) located in valve box and attached with ¾ inch NPT taps with 316 stainless steel nipples and bronze ball shut off valve or stainless. These should be located before the check valves.

5. Guide Rails

a. Guide rails for the pumps shall be a minimum two (2)-inch stainless steel pipe. A stainless steel lifting chain with a safety factor of five (5) shall be provided with each pump.

6. Electrical

a. For electrical requirements see Section 14.5 in Chapter 14-Pump Stations of the New Albany and Floyd County Stormwater and Sanitary Sewer Design Manual.

7. Mechanical Building

a. All lift stations designed with an average daily flow in excess of fifty thousand (50,000) gallons per day shall have erected a block building with brick veneer on the outside. This building will serve as the lift station site for mechanical storage, and to house the electrical equipment. Fluorescent enclosed light fixtures (if out side in shelter, will require cold weather ballast. The building must have a minimum ceiling height of 8’0”, and have 8’0” by 8’0” minimum outside dimensions. The inside dimension shall be a minimum of 6’0” by 6’0”. The interior of the building shall be painted with light colored masonry paint. The truss roof of the mechanical building shall be constructed with asphalt shingles with a pitch sufficient to allow water to run off the roof. The building must be securely anchored to a minimum 6-inch thick poured-in-place concrete reinforced slab. The surface of the slab shall be slightly above surrounding area.

b. The building shall be designed so that it will not detract from the appearance of the surrounding vicinity.

c. A 42” wide (minimum) x 7’ hollow metal door in a steel frame with 2 finish coats of paint must be installed with a 2’ x 2’ louver for ventilation, and an aluminum threshold. The door must have a hasp for padlocking provisions.

8. Site Requirements

a. The contractor shall be responsible for developing a lawn around the lift station by sodding or by seeding with Kentucky 31 variety clear tag grass seed. All banks shall be no steeper than 3 to 1 slope. Gravel or asphalt in fenced area.

b. A bituminous or concrete paved road (minimum 12'0" width) shall be built to the station, which will accommodate maintenance truck traffic. If the station is located on a dead-end street, a paved turn area shall be provided. Road construction shall meet current New Albany street specifications. Pavement shall be one (1) inch INDOT HMA surface over two (2) inches INDOT HMA binder over nine (9) inches INDOT 73 DGA. All thickness refers to compacted thickness. It must also allow for Vac-con truck to have access to wet well for cleaning and support weight of vehicle.

c. A four (4)-foot by four (4)-foot concrete slab, sloping away from the building, shall be provided at the entrance to the building.

d. All aboveground structures, hatch openings, valve vaults, wet wells and driveways shall be designed so that they are inherently protected from a 100-year flood event. Wet well top slabs, valve vault top slabs, and access hatches shall be located above the 100-year flood elevation or flood-proof access hatches shall be provided.

e. Shelter structure with steel posts will be required for smaller stations with shingled roofing and drip edge / vinyl siding and a light system consisting of fixtures to illuminate control panels. Lightning Rods for protection when applicable.

f. The City may require hoist or crane system for larger Stations.

g. Fencing will be either chain link vinyl coated or cedar plank with 20 ft gates / may require barbed wire / this will be determined by the City depending on location of the purposed lift station to be attractive in some areas or for security reasons. Attached to fencing will be emergency phone numbers and name of station along with warning signs and address.

h. The site shall have city water hose bib (non–freeze) with garden hose connection and a backflow preventer (heated or insulated).

9. Miscellaneous

a. A minimum three (3)-inch ductile iron pipe wet well vent shall be installed, with a 180-degree bend with a stainless steel screen.

b. All hardware and fastener items located either inside or directly connected to the wet well and valve vault shall be of stainless steel construction.

c. Pumps shall have a five (5) year warranty provided by the manufacturer. The warranty shall be as follows. 18 months full coverage of pump, 19-36 months 75% coverage, 37-48 months 50% coverage and 49-60 months 25% coverage. The developer or the pump manufacturer can provide this warranty. A certificate of warranty shall be supplied with the pumps. The developer shall warrant all equipment, materials, and workmanship in the installation against defects or failures of any kind for a period of one (1) year from the date the Utility accepts the lift station for operation and maintenance.

d. At project completion the following documents will be provided to the New Albany Sewer Utility prior to City acceptance of the Lift Station: 1) two sets of as-built drawings (24”x 36”), 2) an Autocad file containing the as-built drawings, 3) a PDF file containing the as-built drawings, 4) a PDF file containing the project specifications, and 5) a PDF file containing the shop drawings. Four paper (4) copies of the operation and maintenance manuals shall be provided at this time along with the certificate of warranty, and two paper copies of all shop drawing submittals and documents.

e. A manhole shall be located within ten (10) feet of the wet well on the influent line. The influent line shall be constructed of AWWA C 150 Class 52 (min.) Ductile Iron pipe. This manhole shall provide provisions for bypass pumping. A plug valve shall be placed in the influent line to the liftstation. This valve will be used to isolate the wet well.

f. Two sets of preliminary plans and specifications for the lift station layout and structures shall be submitted for review and approval to the New Albany Sewer Utility prior to completion of final plans and specifications. See design manual Chapter 14 for more information.

g. Certified pump curves shall be supplied with each installed pump. All pumps shall have stainless steel nameplates securely attached. Pump motors shall be non-overloading at all points on the pump curve. The contractor, pump supplier and contractor’s electrical subcontractor shall perform field operation tests, when all construction is complete, to show that all items are working properly and meeting design specifications. A complete written report, containing the above, shall be submitted to the City.

Appendix D

Attribute Table Templates for New Albany Sanitary Sewers and Structures

Sanitary Structure Attribute Legend

Attributes	Field Type	Attribute Definition
INSTALL_DAT	Date	*Original Installation Date . Recommend using Substantial Completion date or start of warranty period.*
NOTHING	Double	*Structure Northing*
EASTING	Double	*Structure Easting*
SHAPE_DES	Text Width 50	*Structure Shape* - Populate with one of the following: **CIRCULAR, RECTANGULAR, SQUARE, OTHER**, in all caps
TYPE	Text Width 50	*Structure Type* - Populate with one of the following: **MANHOLE, AIR_RELEASE_VALVE, VALVE_VAULT, FLOWMETER_VAULT, CLEANOUT, TEE, WYE, DOUBLE_WYE, BEND, WET WELL, GREASETRAP, OTHER, UNKNOWN,** in all caps
RIM	Double	*Structure Rim Elevation*
FLOOR	Double	*Floor Elevation of Structure*
DEPTH	Double	*Structure Depth (Rim-Floor Elevation)*
DROP_PIPE	Text Width 50	*Drop Structure* - **YES/NO** in all caps
DROP_TYPE	Text Width 50	*Structure drop type* - Populate with one of the following: **INTERIOR, EXTERIOR,** in all caps
DROP_NUM	Short	*Number of Drops connected to structure*
INFLOW_PRV	Text Width 50	*Inflow Preventor Installed* - **YES/NO** in all caps
LID_TYPE	Text Width 50	*Lid Type* - Populate with one of the following: S**TANDARD, WATERTIGHT, OTHER**, in all caps
LID_SIZE	Short	*Lide Size* - Populate with one of the following: **24"**
CHIM_SEAL	Text Width 50	*Chimney seal installed* - **YES/NO** in all caps
MATERIAL	Text Width 50	*Structure Material* - Populate with one of the following: **PRECAST_CONC, CIP_CONC, BLOCK, BRICK, OTHER**, in all caps
LINED	Text Width 50	*Has Structure been Lined* - **YES/NO** in all caps
SOURCE	Text Width 50	*Source Information* - Populate with one of the following: **ASBUILT, DESIGN PLAN, MASTER PLAN, GPS, SURVEY DATA, CAD, AERIAL, CCTV, UNKNOWN, OTHER**, in all caps
SOURCE_INF	Text Width 50	*Additional Source Information*
STR_SIZE	Text Width 50	*Structure Size/Diameter* - Populate with one of the following: **36", 42", 48", 60", 72", 84", 96"**
PROJECT	Text Width 50	*Name of project or subdivision or other project information*
DESIGNER	Text Width 50	*Project Designer*
CONTRACT	Text Width 50	*Project Installation Constructor*
SRC_STR_NO	Text Width 50	*Structure number from Data Source (i.e. Structure Number as indicated on design or asbuilt plan)*
CAST_TYPE	Text Width 50	*Casting Type - Neenah or Jordan Ironworks number*
WARRANTY	Text Width 50	*Warranty Period in Months (may consider creating an automated reminder for warranty period expiration)*

Sanitary Sewer Attribute Legend

Attributes	Field Type	Attribute Definition
SUB_TYPE	Short	*Sewer Sub type* - Populate with one of the following: **MAIN, FORCEMAIN, INTERCEPTOR, WM QUALITY** (used for gravity sewers that are pressure class pipe), in all caps
DIAMETER	Short	*Pipe Diameter in Inches* - Populate with one of the following: **3", 4", 6", 8", 10", 12", 15", 18", 21", 24", 27", 30", 33", 36", 42", 48", 54", 60", 66", 72", 84", 96"**
MATERIAL	Text Width 50	*Pipe Material* - Populate with one of the following: **PVC, VCP, DIP, RCP, CIP, CIPP, HDPE, PE, BRICK, STONE, ABS, ~~SCHED40~~, CONC ASBESTOS, SEG BLK, CMP, HOBAS, STEEL, TRUSS, UNKNOW, OTHER**, in all caps
CLASS	Text Width 50	*Pipe Classification* - Populate with one of the following: **OTHER, SDR35, SDR26, SDR21, SDR17, SCH40, SCH80, C900/905, DR9, DR11, DR13.5, DR17, DR26, TCL54, PCL250, PCL350, I, II, III, IV, V, 150, 200, 250, 300, 350, C151, TYPE 1, TYPE 2, TYPE 3, TYPE 4, TYPE 5, TYPE 6, TYPE 7, UNKNOWN**, in all caps
US_INV	Double	*Upstream pipe invert*
DS_INV	Double	*Downstream pipe invert*
SLOPE	Double	*Pipe Slope*
LEN_PLAN	Double	*Published Plan Length*
INSTALLDAT	Date	*Original Installation Date . Recommend using Substantial Completion date or start of warranty period.*
LINED	Text Width 50	*Lined* - **YES/NO** in all caps
SOURCE	Text Width 50	*Source Information - Populate with one of the following:* **ASBUILT, DESIGN PLAN, MASTER PLAN, GPS, SURVEY DATA, CAD, AERIAL, CCTV, UNKNOWN, OTHER***, in all caps*
SOURCE_INF	Text Width 50	*Additional Source Information*
SRC_US_STR	Text Width 50	*Source Plan Upstream Structure*
SRC_DS_STR	Text Width 50	*Source Plan Downstream Structure*
PROJECT	Text Width 50	*Name of project or subdivision or other project information*
DESIGNER	Text Width 50	*Project Designer*
CONTRACTOR	Text Width 50	*Project Contractor*
WARRANTY	Text Width 50	*Warranty Period in Months*

New Albany Wastewater
Sanitary Sewer Attribute Table

SUB_TYPE	DIAMETER	MATERIAL	CLASS	US_INV	DS_INV	SLOPE	LEN_PLAN	INSTALLDAT	LINED	SOURCE	SOURCE_INF	SRC_US_STR	SRC_DS_STR	PROJECT	DESIGNER	CONTRACTOR	WARRANTY

New Albany Wastewater
Sanitary Structures Attribute Table

INSTALL_DAT	NORTHING	EASTING	SHAPE_DES	TYPE	RIM	FLOOR	DEPTH	DROP_PIPE	DROP_TYPE	DROP_NUM	INFLOW_PRV	LID_TYPE	LID_SIZE	CHIM_SEAL	MATERIAL	LINED	SOURCE	SOURCE_INF	STR_SIZE	PROJECT	DESIGNER	CONTRACT	SRC_STR_NO	CAST_TYPE	WARRANTY