Master Drainage Plan
for the
Town of Bayfield
Bayfield, Colorado

September 2014

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Executive Summary

Souder, Miller and Associates (SMA) prepared the following Master Drainage Plan (MDP) under the General Engineering Services agreement between the Town of Bayfield and SMA. The development of the MDP was designated as Task Order No. 5 – Storm Drainage Master Plan. The scope of services included analyzing the Town's existing storm drainage infrastructure and providing planning recommendations for improvements to the existing storm drainage infrastructure to meet the Town's current Infrastructure Design Standards. System analyses include analyses of all culverts, storm drains pipes and inlets, and stormwater ponds.

System Inventory

The Town provided existing infrastructure element information including, but not limited to, drainage element locations (horizontal and vertical), element sizes, element lengths, areas, material types, and other similar information as necessary to describe the system in sufficient detail to allow hydrological and hydraulic analyses of the system. In addition, the Town provided aerial mapping and contour information of the study area. The Town's aerial map was supplemented with topographic data from the United States Geological Survey (USGS) for portions of the study area outside of the Town's aerial mapping. The aerial map, topographic information, and the infrastructure information were used to develop a project base map.

The study area includes 77 culverts, nearly all (96%) of which are corrugated metal pipe (CMP), with only three high density polyethylene (HDPE) culverts. Culvert pipe diameters range from 8 to 36 inches, with 44% of the culverts (34 culverts) being less than the current minimum standard of 18 inches in diameter. The length of culverts within the study area totals approximately 4,100 linear feet.

The study area also includes 138 storm drain pipes, defined as pipes connected to storm drain inlets or manholes, with approximately 63% made of CMP and 37% made of HDPE. Storm drain pipe diameters range from 8 to 48 inches, with approximately 41% of the pipes (57 pipes) being less than the current minimum standard of 18 inches in diameter. The length of storm drain pipes within the study area totals nearly 15,000 linear feet.

A number of culverts and storm drain pipes were silted closed or otherwise obstructed on either the inlet or outlet end, suggesting that more frequent maintenance is required for these pipes. Data regarding pipe size and slopes was estimated for these pipes where the ends of the pipes could not be exposed.

The study area includes 122 inlets, most of which are single inlets, with seven double inlets and two triple inlets. Inlets include 35 surface grates, only, either in the gutter flow line or behind the curb, and 87 combination inlets, featuring both a surface grate in the gutter flow line and a curb opening behind the grate (in the face of the curb). Two thirds (82) of the inlets are located in sag locations, meaning they are at low points relative to the surrounding surface, with the remaining (40) inlets located on grade, meaning the surface slopes continuously through an inlet.

The study area includes 39 ponds constructed for stormwater detention or retention purposes. Approximately half (19) of the stormwater ponds are relatively small, less than 0.1 acre-feet (4,356 cubic feet) in capacity, with only four ponds of relatively large size, more than 1 acre-foot in capacity (measured without freeboard). A number of the ponds do not feature a constructed and reinforced spillway, which could result in overtopping of the pond berms in an uncontrolled manner for larger storms. Some of the ponds appear to have significant sediment accumulated since they were constructed, reducing the available storage volume to less than designed. Some ponds also have substantial vegetative growth, such as willows or cattails. Nearly all of the stormwater ponds are privately owned and maintained, either by individual property owners or by a subdivision homeowner association (HOA). The Town owned and maintained two stormwater detention ponds and shared ownership and maintenance for one stormwater detention pond when the study data was collected; a third town-owned pond was constructed during preparation of the study, but was not analyzed as part of the study.

The Town collected data on irrigation culverts that convey irrigation flows at Town street crossings. The ditch culverts are not considered part of the Town's storm drainage infrastructure and were not analyzed for flow and capacity as part of the MDP.

Following development of the base map, the drainage basins of the study area were delineated based on points of hydraulic analyses. Hydraulic analysis points are locations where stormwater flows are needed to determine the performance of storm water elements and include culverts, storm drain inlets, and stormwater ponds. In addition, hydraulic analysis points are locations where stormwater leaves the study area, including discharges to irrigation ditches or outside the study boundary. Drainage basin delineation was completed using the topographic information of the base map, together with a field review to refine the basin boundaries and verify the storm drainage elements.

Hydrologic and Hydraulic Analysis

Previous analyses of recent population growth for the Town of Bayfield suggest that the Town will likely experience a relatively steady annual growth rate of approximately 4% over the 20-year planning horizon of the MDP. The anticipated growth could result in significant infill development inside the Town limits, but development of the areas immediately adjacent to the Town's current town limits will also likely be necessary to accommodate the anticipated growth during the planning horizon. However, all new development greater than 1 acre in size will be required to adhere to the current Standards, which require that runoff from the 100-year storm be detained and released at the 5-year historic rate. This suggests that future development will actually decrease the downstream runoff rate from major storm events and improve the conveyance conditions of existing storm drainage infrastructure. The actual extent of this improvement is dependent upon the magnitude of future development that occurs within a particular drainage basin, but the key point is that the current Standards will protect the Town's existing infrastructure from storm water impacts of future development and should not require existing structures that have sufficient capacity to be replaced with structures with greater capacity to allow for future growth. Therefore, there was no need to project development locations and densities for anticipated growth and determine the impact on existing storm drainage infrastructure as part of this study.

Following the development of the base map, delineation of the drainage basins, and verification of the elements of the existing drainage system, a hydrological and hydraulic analysis of the system was completed. The hydrological analysis included the estimation of runoff resulting from the 5-year and 100-year storm events, as specified in the Town's Infrastructure Design Standards (Standards). Rainfall data was obtained from the National Weather Service and soil types in the area were determined from the Natural Resources Conservation Service (NRCS) Web Soil Survey website. Peak flow rates were estimated for each basin and routed through the study area and storm drainage elements. The U.S. Environmental Protection Agency's (EPA) Storm Water Management Model (SWMM) operating within the Autodesk Storm and Sanitary Analysis software was used to model the hydrology and hydraulics of the study area. Culverts, storm drain pipes, and storm drain inlets were evaluated relative to the Town's Standards, whereas stormwater ponds were evaluated relative to percent reduction of peak flow and overtopping of the pond berms. Due to the lack of detailed topographic data at culvert and inlet locations, assumptions regarding allowable culvert headwater depth and allowable gutter water depth and spread were necessary to complete the hydraulic analysis. The accuracy of these assumptions, which are conservative, may have resulted in identification of some storm drainage elements for further investigation that may actually meet the Town Standards.

Culverts, storm drain pipes, and storm drain inlets that did not meet the design requirements of the Town's Standards were recommend for further investigation and ranked with "high", "medium", and "low" priorities based on the apparent exceedance of the Standards. Stormwater ponds that overtopped, did not have a reinforced overflow spillway, or appeared to have accumulated sediment or vegetative growth were identified. "Pond Concern Levels" were identified for overtopping stormwater ponds based on the amount of flow estimated to overtop the ponds.

Modeling Results

The results reveal that 49 culverts (64% of the total evaluated) are estimated to not meet the design standards for the 5-year storm and 58 culverts (75% of the total evaluated) are estimated to not meet the design standards for the 100-year storm. Storm drain pipes were found to generally be more compliant with the Standards, with 42 storm drain pipes (30% of the total evaluated) estimated to not meet the design standards for the 5-year storm and 60 storm drain pipes (43% of the total evaluated) estimated to not meet the design standards for the 100-year storm. Inlets also were found to be generally more compliant with the Standards, with only 24 inlets (20% of the total evaluated) estimated to not meet the design standards for the 5-year storm and 42 inlets (34% of the total evaluated) estimated to not meet the design standards for the 100-year storm.

Stormwater pond performance was generally either quite good or quite bad in terms of overtopping and reduction in stormwater discharge rates. 41% (17 of 39) of the ponds within the study area are estimated to overtop during the 5-years storm event and slightly more than half (22 of 39) of the ponds within the study area are estimated to overtop during the 100-year storm event. The peak basin discharge rate is estimated to be reduced by 50% or more by 62% (24 of 39) of the ponds for the 5-year storm and approximately half (19 of 39) of the ponds for the 100-year storm, with 9 of the ponds reducing the basin flow by more than 90% for the 100-year storm and several estimated to not discharge at all during the 100-year storm event (functioning as retention ponds). In contrast, nearly one-fourth (9 of 39) of the ponds reduce the peak basin discharge rate by less than 10% for the 5-year storm and slightly more than one-fourth (11 of 39) of the ponds reduce the peak basin discharge rate by less than 10% for the 100-year storm, with several ponds estimated to not reduce the basin flow at all due to the small size and/or undersized outlet structure. The three ponds wholly or partially owned and operated by the Town that were analyzed as part of this study performed very good, with none of the ponds estimated to overtop during either storm event, all three of the ponds estimated to reduce the peak basin discharge by more than 50% for both storm events, and one pond estimated to reduce the peak basin discharge by more than 90% for the 100-year storm.

Preliminary Budgetary Costs

Preliminary budgetary costs were developed for storm drainage elements within the study area that did not satisfy the 100-year design criteria. To develop budgetary costs, identified culverts and storm drain pipes were assumed to be replaced with a pipe 6 inches larger in diameter, with a minimum pipe size of 18 inches in diameter, whereas one additional inlet was assumed to be added at, or upstream, of identified inlets. Budget costs for pond improvements were limited to construction of reinforced spillways for ponds lacking this feature and removal of accumulated sediment where apparent.

Total budgetary costs for culverts recommended for investigation are estimated to be approximately $403,000. Total budgetary costs for storm drain systems recommended for investigation are estimated to be approximately $1,754,000. Budgetary costs for improvements to the Lower Dove Ranch storm drain system, consisting of extension of the piped storm drain system under CR 501 and the Schroeder Ditch and then to the Los Piños River via an open channel, are estimated to be $450,000. The total budgetary cost for pond cleaning and weir construction is estimated to be approximately $62,000.

Conclusions

The modeling results and budgetary costs in this report should be considered preliminary, based on the level of analysis of a Master Drainage Plan. To refine the storm drainage improvement costs, elements identified for investigation should be analyzed with detailed site-specific topography at the element location and detailed hydrologic analysis to confirm whether or not the element meets the design Standards. Detailed costs should then be developed based on site-specific designs determined to be necessary to meet the design Standards. Ownership of culvert and storm drain elements included in the study should be determined to establish which elements the Town is responsible for.

Additional observations include the need to be able to continue to discharge runoff to irrigation ditches when they are piped, the conservative nature of the Town's current storm water detention standards related to infill development, the recommendation for consideration of development of regional detention ponds, primarily when development of areas outside of the current study area occur, and the need for maintaining storm drainage infrastructure to keep it functioning at design capacity.

1.0 – General Background

1.1 Master Drainage Plan

The Town of Bayfield (Town) contracted with Souder, Miller and Associates (SMA) to prepare a Master Drainage Plan (MDP) under the General Engineering Services agreement between the Town of Bayfield and SMA. The development of the MDP was designated as Task Order No. 5 – Storm Drainage Master Plan. The scope of services for the Task Order and the authorization to proceed with the work is dated May 16, 2013.

1.2 Community Overview

The Town of Bayfield has served as the commercial and cultural center for eastern La Plata County and the Pine River Valley since the Town was incorporated August 18, 1906, when local residents donated land to create a supply town near the Los Piños (Pine) River. The community is situated in the eastern part of La Plata County in southwestern Colorado. It is located approximately 18 miles east of Durango and 40 miles west of Pagosa Springs on Highway 160. Figure 1 shows the location of the Town relative to other communities in Southwest Colorado. The Town is located at an elevation of approximately 6,900 feet, and south of the San Juan Mountain range, which features peaks over 14,000 feet in elevation. The Town is situated between two significant reservoirs, Vallecito Reservoir, located 15 miles to the north, and Navajo Reservoir, located 18 miles to the southeast.

The Los Piños River, a perennial river with headwaters in the San Juan Mountain range, is the major water course in the study area. Potential wetlands occur throughout the study area, although many may be due primarily to irrigation and/or leaky irrigation ditches. The flood limits of the Los Piños River have been determined by the Federal Emergency Management Agency (FEMA) and a portion of the study area is located within the 100-year flood limits of the River (see Appendix A). Runoff from nearly the entire study area flows to the Los Piños River or irrigation ditches that eventually discharge to the Los Piños River; runoff from only a minor portion (Sunrise Estates Subdivision) flows to Beaver Creek, a tributary to the Los Piños River located east of Bayfield.

Historical population estimates are not available for the entire study area, but are available for the Town of Bayfield, which comprises the majority of the study area population. The 2010 Census population estimate for Bayfield was 2,333 with an average household size of 2.58 people per household unit. Based on the 30-year period from 1980 to 2010, the annual growth rate for the Town has averaged approximately 4.0%. Using this growth rate and a 20-year planning period, the current (2014) population for the Town of Bayfield is estimated to be 2,729 and projected to be 5,750 in the year 2033, an increase of approximately 3,000 people over the planning period.

Currently, there are four residential subdivisions in Bayfield with undeveloped lots: Dove Ranch, Mesa Meadows, Fox Farm Village, and Sunrise Estates, which provide a total of 171 platted but undeveloped residential lots. In addition, the Dove Ranch and Clover Meadows subdivisions have an estimated 231 unplatted residential lots within the subdivision boundaries, depending on the lot sizes. This yields an estimated total of 402 residential lots within existing subdivisions, which is equivalent to 1,037 additional residents, based on the 2010 Census average of 2.58 people per Bayfield household. This indicates that additional residential development, either infill of currently vacant property within Town limits or development of newly annexed areas adjacent to or near the Town's current boundaries will be required to meet the anticipated demand for housing due to population growth.

Similarly, the Town's principal commercial property subdivision, Bayfield Center, has 21 undeveloped platted lots. Depending on the rate of commercial development, it is likely that additional commercial properties will be needed over the 20-year planning period to provide for the growth of commercial development.

Future growth for the Town is anticipated to be predominantly infill of currently vacant lands and/or on the periphery of the Town, primarily north, south, and east, with limited growth on the west side due to the floodplain development limitations in the Los Piños River valley.

1.3 Area Climate

Located in the foothills of the San Juan Mountains, Bayfield experiences a four-season climate. Long-term climate data is available from climate stations near Ignacio and Durango, Colorado, but no long-term climate stations are located in or near Bayfield. Ignacio is located approximately 7 miles south of Bayfield and Durango is located approximately 17 miles west of Bayfield. Ignacio is likely somewhat milder and drier than Bayfield, with Bayfield likely being more similar in climate to Durango.

Durango and Ignacio climate data show that July typically has the highest average monthly high temperature in the upper 80s (°F) and January typically has the lowest average monthly low temperature near 10°F. Average precipitation for Durango is 21.1 inches and 14.8 inches for Ignacio. Summer and early Fall months (July through October) have the highest average rainfall amounts, typically in the form of afternoon and early evening thunderstorms, often with high intensity, short duration rain events. June typically experiences the lowest rainfall of all months of the year. Precipitation during winter months is generally in the form of snow. Climate data for the Durango and Ignacio climate stations, obtained from the Western Regional Climate Center, is included in Appendix B.

1.4 Plan Objectives

The Master Drainage Plan (MDP) objectives included the following:

1. Define and characterize the area that impacts the Town's existing stormwater infrastructure;
2. Analyze the study area under the Town's current stormwater design criteria design storms;
3. Determine how the Town's existing stormwater infrastructure performs under the design storms and identify deficient infrastructure elements;
4. Provide general recommendations for element improvements necessary to meet the Town's design criteria for stormwater infrastructure; and
5. Develop costs associated with the recommended element improvements.

2.0 – Plan Approach

The general approach for developing the MDP began with a thorough inventory of the existing stormwater management system, i.e. identifying the various elements of the stormwater system. The study area was then divided into drainage basins with points identified for each basin as the points of hydrologic analysis. Stormwater system elements, such as culverts, inlets, and ponds, establish the locations of analysis points. Flow paths, i.e. the paths that runoff follows from the upper elevation to the analysis point of each drainage basin, were determined throughout the study area.

Hydrologic modeling of the basins used the 5-year and the 100-year design storm events, as specified in the Town's Infrastructure Design Standards (Standards) to estimate the runoff generated in each of the basins for these events. Land use within each basin, together with basin area and rainfall data, was used to estimate peak stormwater runoff rates. The runoff rates are reported as flows in cubic feet per second, cfs.

Hydraulic modeling of the basins routed the estimated flows through the various stormwater system elements of each basin. Results were compared to the Town's Standards. If a drainage element does not meet the Standards, i.e. culvert surcharging above design limits, street spread or curb depth exceeding design limits, pond overflowing, or similar, the element is identified as requiring site-specific analysis to verify the results and, upon verification, determine the design upgrades required to meet the Standards.

Cost estimates for replacement or supplemental elements were developed for existing elements preliminarily identified as being inadequate. The scope of the MDP did not include making design-level analysis and recommendations; therefore, the solutions included in the MDP are estimates, only, to provide budgeting costs for the Town. Verification of the design deficiencies and determination of design solutions will allow the Town to refine the budget for needed storm drainage improvements.

3.0 – System Inventory

3.1 Base Map Development

3.1.1 – Town-Supplied Information

The Town provided aerial maps of the study area, which included topographic data in the form of contour mapping, street and building outlines, major irrigation ditches, and significant vegetation. The contour mapping provided contour intervals of 2-feet. Aerial mapping and contour mapping is used as the base map for all MDP exhibits.

In addition to the aerial mapping and topographic information, the Town's surveyor provided survey documentation, i.e. location, size, material type, etc. for each element of the stormwater system. The survey data provided by the Town's surveyor included location data (horizontal and vertical) for storm drainage system components. These data included the following: a survey of culvert pipes to obtain location, culvert diameter, type of pipe material, length, and invert elevations; survey of curb or other grated inlets to obtain location, depth of inlet, diameter of pipes into and out of inlet, pipe material, and the invert(s) elevation of the pipes in the inlet; survey of detention ponds to obtain bottom of pond elevation, top of pond elevation, perimeter location (horizontal and vertical) of the pond berm and bottom, outlet pipe sizes and locations, type of outlet pipe material, inverts of outlet pipe, and size and elevation of outlet structure, if any; and other similar storm system component information. Culverts were considered to be components of the Town's storm drainage system if they crossed under streets and the primary purpose was not conveyance of irrigation water. Private culverts under driveways were not documented and analyzed.

The survey data was presented as point data, allowing inlet locations, storm drain pipe and culvert alignments, and detention pond geometry to be generated. In a limited number of cases, survey data was not provided due to buried structures, thick brush, private property access issues, or other constraints. These data gaps are listed on the element inventory tables. Where necessary for the functioning of the hydraulic model, assumptions regarding locations and elevations of elements were made.

3.1.2 - Supplemental Information

Supplemental topographic information was required for the development of the base map for portions of the study area outside of the limits of the Town's aerial maps. This supplemental topographic information was obtained from the Internet web site of ChartTiff, which provides contour information based on the United States Geological Service (USGS) Digital Elevation Model (DEM). The supplemental topographic information was matched to the Town's aerial data both horizontally and vertically to allow delineation of the study area boundary.

Figure 2 shows the topographic base map with the Town limits and the drainage study limits.

3.2 Inventory of System Elements

The elements of the existing stormwater management system were overlaid on the topographic map to form the MDP base map. This inventory of the existing system elements was verified by conducting a comprehensive field inspection of the storm drainage system. The field inspection collected information including, but not limited to, locating and identifying type of curb and gutter in-place throughout the system, size and type of inlets, i.e. curb inlets or area inlets, and types of grates on the inlets, i.e. parallel, perpendicular, curved or straight vane, locations of drainage swales and ditches, detention pond outlet structure size and geometry, identification of discharge points from detention ponds, identification of flow paths for drainage waters, and general confirmation of the drainage basins configurations. It should be noted that some of the elements identified within the study area may be the responsibility of CDOT, La Plata County, or private property owners, but were analyzed as part of the study. All stormwater ponds are understood to be privately owned and maintained but were analyzed as part of this study to identify performance deficiencies. Figure 3 shows the base map together with the locations of the storm drainage elements within the study area.

3.2.1 – Culvert Inventory

Table 1 details the data collected for the culverts identified within the study area, not including pond outlet pipes. The study area includes 77 culverts, nearly all (96%) of which are corrugated metal pipe (CMP), with only three high density polyethylene (HDPE) culverts. Culvert pipe diameters range from 8 to 36 inches, with 44% of the culverts (34 culverts) being less than the current minimum standard of 18 inches in diameter. The length of culverts within the study area totals approximately 4,100 linear feet.

A number of culverts were silted closed or otherwise obstructed on either the inlet or outlet end, as noted in Table 1, suggesting that more frequent maintenance is required for these pipes. Data regarding pipe size and slopes was estimated for these pipes where the ends of the pipes could not be exposed.

3.2.2 – Storm Drain Pipe Inventory

Table 2 details the data collected for the storm drain pipes identified within the study area. The study area includes 138 storm drain pipes, defined as pipes connected to storm drain inlets or manholes, with approximately 63% made of CMP and 37% made of HDPE. Storm drain pipe diameters range from 8 to 48 inches, with approximately 41% of the pipes (57 pipes) being less than the current minimum standard of 18 inches in diameter. The length of storm drain pipes within the study area totals nearly 15,000 linear feet.

A number of pipes were silted closed or otherwise obstructed on either the inlet or outlet end, as noted in Table 2, suggesting that more frequent maintenance is required for these pipes. Data regarding pipe size and slopes was estimated for these pipes where the ends of the pipes could not be exposed.

3.2.3 – Storm Drain Inlet Inventory

Table 3 details the data collected for the storm drain inlets identified within the study area. The study area includes 122 inlets, most of which are single inlets, with seven double inlets and two triple inlets. Inlets include 35 surface grates, only, either in the gutter flow line or behind the curb, and 87 combination inlets, featuring both a surface grate in the gutter flow line and a curb opening behind the grate (in the face of the curb). Two thirds (82) of the inlets are located in sag locations, meaning they are at low points relative to the surrounding surface, with the remaining (40) inlets located on grade, meaning the surface slopes continuously through an inlet. Photos 1 through 8 in Appendix C show various types of inlets and inlet grates.

3.2.4 – Stormwater Pond Inventory

Table 4 details the data collected for stormwater ponds identified in within the study area, including details of the pond outlet structure, if any, while Table 5 details the pond outlet pipes. The study area includes 39 ponds constructed for stormwater detention or retention purposes. Approximately half (19) of the stormwater ponds are relatively small, less than 0.1 acre-feet (4,356 cubic feet) in capacity, with only four ponds of relatively large size, more than 1 acre-foot in capacity (measured without freeboard). A number of the ponds do not feature a constructed and reinforced spillway, which could result in overtopping of the pond berms in an uncontrolled manner for larger storms. Some of the ponds appear to have significant sediment accumulated since they were constructed, reducing the available storage volume to less than designed. Some ponds also have substantial vegetative growth, such as willows or cattails. Nearly all of the stormwater ponds are privately owned and maintained, either by individual property owners or by a subdivision homeowner association (HOA). The Town owned and maintained two stormwater detention ponds and shared ownership and maintenance of one stormwater detention pond when the study data was collected; a third town-owned pond was constructed during preparation of the study, but was not analyzed as part of the study. Town-owned ponds serve Town Hall (Pond No. 37) and the Senior Center (Pond No. 38); the pond serving the Joint Maintenance Facility (Pond No. 25) is jointly owned by the Town and La Plata County; the third town-owned pond constructed during preparation of the study was for the Parks and Recreation Department

Shop. Photos 9 through 30 in Appendix D show a number of ponds within the study area, some with significant maintenance issues.

3.2.4 – Irrigation Ditch Culvert Inventory

The Town collected data on irrigation culverts that convey irrigation flows at Town street crossings. The ditch culverts are not considered part of the Town's storm drainage infrastructure and were not analyzed for flow and capacity as part of the MDP.

4.0 – Drainage Basin Delineation and Characterization

The characteristics of drainage basins are an important factor in completing an analysis of the basins and estimating the quantity of drainage water that will be generated and the rate at which stormwater will runoff from the basins. The characteristics considered include area, soil types, surface slopes, the nature and extent of cover conditions, and/or other characteristics that could impact stormwater discharges from a basin. Each basin reacts to storm events in different ways, depending on its unique characteristics.

4.1 Points of Hydraulic Analysis

Hydraulic analysis points include culverts, storm drain inlets, or stormwater ponds where stormwater flows are needed to determine the element performance for the design storm events. Many points of hydraulic analysis discharge to downstream basins or storm drain pipes; other points of hydraulic analysis discharge to study area outlet points, where stormwater runoff leaves the study area, such as at irrigation ditches, the Los Piños River, or other points along the study area boundary.

4.2 Drainage Basin and Flow Path Delineation

The drainage basins were configured around the points of hydraulic analysis and study area outlet points using the topography of the study base map. Area topographically upstream of each point of hydraulic analysis defines a drainage basin.

The basin configuration map was then taken into the field to confirm the configuration and to adjust the basin boundaries, as necessary, to match observed field conditions. Adjustments in basin boundaries were necessary where man-made features, such as roadways, roadway ditches, curb and gutter, irrigation ditches, and similar features intercept and redirect flows in a manner that was not apparent at the scale of the study base map. The delineated basins within the study area are shown in Figure 4.

While confirming the basin configuration, the flow paths of stormwater runoff within each basin was identified. A flow path is the route that runoff takes from the uppermost point in a basin to the point of analysis. Flow paths for each basin are shown in Figure 4.

The boundary of the outermost delineated basins defines the boundary of the study area. The study area is primarily confined to the area within the Town limits, plus limited areas outside of the Town limits that generate drainage flows into the study area. The study area encompasses approximately 1000 acres, which includes the entire 770 acres comprising the Town limits. The study area boundary is shown in Figure 2.

After basin delineation and flow path identification was complete, the information was forwarded to the Town's staff for review and concurrence.

4.3 Basin Areas

The area of a drainage basin, along with other factors, has a direct correlation to the quantity of storm water runoff from the design storm. Basin surface areas were determined for modeling storm water runoff from each basin. The study area was divided into 339 basins, ranging in size 0.05 to 48.4 acres, with an average basin size of 3.85 acres. The large number of basins was required because of the large number of hydraulic analysis points requiring design flows within the study area. The area determined for each basin is shown in Table 6.

4.4 Basin Topography

The study area generally slopes from the northeast to the southwest, ranging from 7,600 to 6,900 feet in elevation, with higher elevations and generally steeper slopes in the northeast portion of the study area and lower elevations and generally flatter areas in the southwest portion of the study area.

4.5 General Land Use

Land uses within the study area consist primarily of residential developments, with a significant element of agricultural, grazing, and/or open space mixed throughout. In addition, there is an area of retail commercial and/or office-professional development, immediately north of US Hwy 160. The older part of the Town, located between Bayfield Parkway and Buck Hwy, and north of the Pine River represents a mixture of residential and retail commercial land uses. To the east and south of Bayfield Parkway, there is an area of light industrial type land uses, wherein the Town's and the County's operations centers are located, along with a bottled gas provider and several smaller industrial type land user.

4.6 Surface Conditions

Identifying surface conditions in a drainage basin is essential to accurately predicting a basin's response to a storm event. The most significant surface conditions considered are cover type and slope.

Cover type is classified as impervious or pervious. Impervious cover is a surface that allows little to no water to infiltrate the soil during a rain fall event. Examples of impervious cover include asphalt or concrete streets, parking lots, and sidewalks; building roofs; and rock outcroppings. Impervious cover results in high runoff quantities and high runoff rates. Cover that is not impervious is considered to be pervious. However, stormwater runoff response from pervious surfaces will vary significantly depending on the nature of the pervious cover. As an example, a pervious area of compacted gravel or soil, used as a parking or driving area, will respond to a rain event more similar to an impervious surface, with higher runoff quantities and runoff rates, whereas an area that has ground cover of heavy grass or other vegetation, or an area that is cultivated such as a plowed field, will have much lower runoff quantities and runoff rates, all other characteristics being equal. Vegetative cover and impervious area estimates were based on field observation during basin delineation, aerial photos, and land use maps. Impervious percentages assigned to each basin of the study area are included in Table 6.

The second surface condition influencing drainage is the slope of the surface. Steeper slopes result in higher rates of runoff over a shorter period of time. When combining cover conditions and surface slopes, the impacts to drainage can be significant. In completing the analysis of the defined drainage basins for the MDP, each drainage basin was considered separately and the surface conditions defined for each basin.

4.7 Soil Characteristics

Soil conditions have an impact on stormwater runoff response, particularly where impervious ground cover is not present. Soils are classified based on the infiltration and runoff potential for the purposes of this study. Based on data obtained from the Natural Resources Conservation Service (NRCS) Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/), the majority of the study area is made up of soils classified as Corta Loam with surface slopes ranging between 1% and 8%, with an average surface slope of approximately 4%. An area to the northeast, which is outside of the Town limits but contributes to the Town's drainage, has a soils classification of Archuleta-Sanchez complex with surface slopes ranging from 12% to 65%, with an average surface slope of approximately 40%. A small percentage of the study area, located in the downtown and other river bottom area, is classified as Sycle fine sandy loam with surface slopes between 1% and 3%.

The NRCS assigns soils to one of four hydrologic soil groups (HSG) according to how fast water will infiltrate into the soils when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long duration storm events. According to the NRCS Web Soil Survey, the majority of the study area, located in the upland north and east portions of the Town is classified as Group D soils, while the downtown and lowland areas located in the southwest portion of the study area are classified as Group B soils. Group D soils have a very slow infiltration rate and high runoff potential, whereas Group B soils have a moderate infiltration rate and consequently a lower runoff potential than Group D soils.

Appendix E contains a NRCS map showing the soil classifications and HSGs assigned to those soils within the study area.

4.8 Hydrologic Features of Basins

The hydrologic features of the Bayfield drainage system vary from basin to basin and even within each basin. Much of the variation is related to the age of the improvements/developments within the basin. Older developments have different features than those of the newer development. Portions of the older residential development in the Town, as well as the Bayfield Center commercial development, do not have curb and gutter. While the streets are paved in most of these areas, drainage water is conveyed, in a generally south or southwest direction in shallow, often poorly defined, earthen ditches located at the edge of a street or, in some situations, at the rear lot line. In older residential areas, and some newer areas, roll curb and gutters have been installed. There appear to be several different cross-sections for the roll type curb and gutter, all of which appear to have a fairly shallow gutter depth, approximately 4-inches. Many of these installations are located in areas of relatively steep grades and in locations where flow directions are required to change to follow the curb and gutter alignment. It appears that any substantial amount of rainfall could result in overtopping of these shallow gutter sections, allowing drainage water to flow over the curb section and out of the gutter channel.

The Town Center area, located on East and West Mill Street, and the residential area one block to the south of Mill Street on South Street, is served with an underground piped storm sewer system. The system is comprised of pipes, manholes, and curb inlets. The curb and gutter section in this area are all 6-inch vertical curb, adjacent to crowned street sections. In addition to the piped storm sewer system in the Town Center area, there are piped systems along Buck Highway from Bayfield Parkway south approximately to Mars Drive, in more recent residential subdivisions, including Mesa Meadows, Dove Ranch, Cinnamon Heights, Sunrise Estates, and Fox Farm Village, as well as several other small piped systems located in various part of the Town.

A significant feature of the Town's storm drainage system is the interception of runoff by, or discharge of piped stormwater runoff to, irrigation ditches and laterals. Several irrigation companies have ditches and laterals that pass through the study area. These ditches are for the most part open and intercept drainage water from the areas above the ditch. These ditches and laterals intercept or accept runoff from numerous basins, primarily in the northern and eastern portion of the study area. This limits the discharge of runoff from basins in the upper part of the watershed to basins in the lower part of the watershed, thereby limiting the necessary storm drainage infrastructure capacity in the lower portions of the watershed. In some cases of recent development, ditch companies have required the developer to pipe the ditch through the development and provide a means of conveying the stormwater over or under the piped ditch, eliminating the historical discharge to the ditch.

4.9 Land Uses

The Town identified 16 different land use designations on their March 2007 Land Use Designation map. For the purposes of the MDP, these land use designations have been simplified into five types of uses shown below. The land use categories overlaid on the project study area are shown in Figure 5 and produce the following area percentages:

Type of Land Use	Approximate Percentage of Study Area
• Residential	53.6 %
• Retail Commercial	8.4 %
• Industrial	1.5 %
• Schools/Parks/Community Services	13.5 %
• Vacant Land	23.0%

4.10 Known Storm Drainage System Problems

The only significant storm drainage problem area that has been identified by the Town is the storm water discharge from the Dove Ranch Subdivision at the north end of Town. This residential subdivision was approved with no stormwater detention with the intent to direct the runoff under CR 501 and the Schroder Ditch through a 36" diameter pipe and then through an open channel to discharge to the Los Piños River. However, the storm drainage infrastructure was only completed as far as just east of CR 501 and dead ends in a manhole with no pipe outlet. When significant storms occur, the water level builds up in the manhole sufficiently to lift the manhole lid off of the manhole and overflow to the water quality pond downstream (Pond #1 in Figure 3). The flow then continues through Pipe #1, a 24-inch diameter CMP culvert under CR 501, which discharges to the Schroder Ditch. In addition to the storm drain pipe presumably remaining full of water upstream of the dead-end manhole after storm events, the increased runoff as a result of the residential development has reportedly caused erosion of the ditch at the culvert outlet.

The Town has not identified any other specific problem areas within the Town's storm drainage system. This may be because the typical storm event is a relatively frequent storm of relatively low intensity over a relatively short period of time. While the 5-year design storm is a relatively common event, the 100-year design storm may or may not have occurred in the recent past. Therefore, it is possible that the Town's storm drainage system has not been tested with the larger design storm in the recent past; should larger events occur, it is likely that shortcomings of the storm drainage system will be apparent.

4.11 Potential Environmental Issues

The principal potential environmental issue is related to new construction, replacement, or maintenance of storm drainage infrastructure. Many elements of the existing infrastructure or potential new infrastructure may be located within or adjacent to potential wetlands. It may be necessary to identify whether suspect areas are considered wetlands and consult with the U.S. Army Corps of Engineers before disturbing these areas prior to construction or maintenance. In addition, activities near the Los Piños River may also be impacted by the presence of bald eagle nests, Southwest Willow Flycatcher, or other protected species. Potential environmental issues will need to be identified and addressed as specific projects are developed.

4.12 Operation and Maintenance Issues

Based on the field inspections made while compiling the inventory of the storm drainage system, the Operation and Maintenance (O&M) issues observed included the following:

- Inlet grates blocked or partially blocked with trash and or leaves.
- Catch basins below grate covering, blocked or partially blocked with trash, leaves, or sediment.
- Culvert openings blocked or partially blocked with trash, leaves, or sediment.
- Detention/retention ponds severely sedimented and holding capacity reduced.
- Detention/retention pond outlet pipes silted over.
- Detention/retention ponds overgrown with vegetation.
- Damaged culvert ends, (inlet and outlet).

Appendices C and D contain photos of example inlets and ponds, some in good condition and some showing O&M issues.

5.0 – Hydrology Study

5.1 Hydrologic Analysis Criteria

The hydrologic analysis criteria are found in Section 5 of the Town of Bayfield's Infrastructure Design Standards. Hydrologic analysis criteria include the following:

- Analysis of minor and major design storms of 5-year and 100-year recurrence intervals, respectively.
- Use of the Rational Method, NRCS WinTR-55, or USGS regression equations for stormwater runoff estimates, or other approved methods and software.
- Rainfall data from National Oceanic and Atmospheric Administration's (NOAA) Atlas 14 via NOAA's Precipitation Data Frequency Server (an update of NOAA's Precipitation-Frequency Atlas of the Western United States referenced in the Town Standards).
- Minimum of 10 minutes to be used for times of concentration.

These design standards were adopted less than two years ago. As a result, most of the development located within the Town was completed well before the Standards were adopted; therefore most of the existing storm drainage system was not designed to the current Standards, but some unknown and likely varying criteria. However, in order to evaluate the adequacy of the existing infrastructure under the current design standards, the study area was modeled under the 5-year and 100-year storms to determine flows for evaluating the drainage elements.

Much of the storm drainage infrastructure was likely not designed to convey or detain the 100-year storm event runoff. However, this event was used in this analysis in accordance with the Standards to determine which storm drainage facilities do perform in accordance with the current standards and which ones do not or require additional investigation. The facilities that do not function in accordance with current performance requirements will be recommended for additional analysis and potential upgrading or replacement.

Analysis of currently undeveloped land within the study area did not require estimates of future development types or densities because the Town's current design standards require that future development control runoff from the site from the 100-year storm to the historical discharge rate from the 5-year storm. Therefore, development of currently undeveloped land will actually decrease the discharge from the 100-year storm from the current undeveloped condition. Analysis of undeveloped land using the current conditions is therefore a conservative approach as development will actually reduce the peak discharge from the land.

5.2 Hydrologic Model Inputs

5.2.1 Rainfall Data

Rainfall data was obtained from the National Oceanic and Atmospheric Administration's (NOAA) Precipitation Frequency Data Server (PFDS) (http://hdsc.nws.noaa.gov/hdsc/pfds/), which interpolates NOAA Atlas 14 precipitation frequency estimates and associated information for a specified location. The PFDS then outputs local precipitation information as a table with rainfall depths as a function of storm duration and average recurrence interval. Appendix F includes the rainfall data for the Bayfield area generated from the NOAA PFDS.

5.2.2 Time of Concentration

The time of concentration is an estimate of the time that it takes stormwater runoff to reach a basin outlet or design point from the most remote point in the basin. The time of concentration was determined for each basin using the delineated flow paths and the corresponding path lengths, average slopes, resistance to flow of the ground surfaces, and rainfall intensities. Rainfall intensity is dependent upon the design storm frequency, with higher intensities for the 100-year storm and lower intensities for the 5-year storm, all other things being equal.

5.2.2 Curve Numbers

Soil Conservation Service (SCS, now NRCS) curve numbers (CNs) are factors indicating the potential for excess runoff from a given rainfall event. Higher CNs indicate higher runoff potential and lower CNs indicate lower runoff potential, all other things being equal. Estimation of CNs considered the land use, ground cover, soil type (HSG), and percent imperviousness. Curve numbers within the study area ranged from 65 to 95. Figure 5 shows the CN assigned to each land use designation within the study area and Table 6 shows the CN assigned to each basin and sub-basin.

5.2.3 Basin Areas

Basin areas determined in Section 4.3 were input for each basin or sub-basin.

5.3 Hydrologic Model

The U.S. Environmental Protection Agency's (EPA) Storm Water Management Model (SWMM) operating within the Autodesk Storm and Sanitary Analysis software was used to model the hydrology of the study area. SWMM implements a modified SCS model to estimate peak discharges for urban drainage basins. SWMM operates under the assumption that the calculated runoff is a function of the curve number, a NRCS Type II rainfall distribution, and the time of concentration. Each basin was linked to an outflow corresponding to a specific culvert, inlet, or pond. Model runs were completed for both the minor and major storms.

5.4 Hydrologic Model Results

Modeling outputs for each basin include calculated time of concentration, estimated peak runoff rate, and estimated runoff volume for both the minor and major design storms. Modeling input and results are included in Table 6.

Times of concentration ranged from under 4 minutes to slightly over 3 hours for the 5-year storm and slightly over 3 minutes to approximately 2 hours and 30 minutes for the 100-year storm. Although the Town's standard is to use a minimum time of concentration of 10 minutes to avoid overestimating peak flows from very small basins, SWMM does not allow this limitation, resulting in potential overestimation of peak flows from these basins. However, given that these basins typically have very small flows, the overall impact is minor.

Estimated peak flows ranged from 0.1 to approximately 54 cubic feet per second (cfs) for the 5-year storm and 0.2 to approximately 104 cfs for the 100-year storm. The 100-year storm peak rate of discharge was generally estimated to be approximately double the 5-year storm peak rate of discharge.

6.0 – Limited Hydraulic Study

The hydraulic model is considered a limited hydraulic study due to the lack of design-level topographic information for design points and the in-depth analysis required to pinpoint capacity issues and size structures. The Town's aerial mapping has 2-foot contours with an interpolated accuracy of 1 foot, which is good for general planning purposes but does not allow accurate determination of design-level elevations and slopes. This limits the ability to determine maximum headwater elevations for culverts (before the flows would overtop a roadway or other adjacent ground), as well as longitudinal and cross slopes for streets to determine inlet flow capture and bypass. Assumptions regarding elevations and slopes used in this limited hydraulic study are detailed in the sections discussing the model input parameters for the specific drainage elements.

6.1 Hydraulic Design Criteria

The design criteria for hydraulic analysis of storm drainage infrastructure are found in Section 5 of the Town of Bayfield's Infrastructure Design Standards. Storm drainage system elements are to be designed to safety handle the minor storm event, providing convenience for residents, reducing street flooding, and protecting against regular and recurring damage from these frequent storms. Drainage system elements are to be designed to safely handle runoff from major storms and minimize property damage and loss from these higher intensity, yet infrequent storm events. Specific hydraulic design standards include the following:

- Analysis of street flow depth and spread and inlet capture and bypass using methods described in the Federal Highway Administration's (FHWA) Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22 (HEC-22). Inlet clogging factor of 50% to be used in analysis.
- Flow depths in storm drain pipes and culverts determined using the Manning equation.
- Analysis of culvert flow using methods presented in FHWA's Hydraulic Design of Highway Culverts, Hydraulic Design Series No. 5 (HDS-5).
- Culvert Performance Criteria:
    - The minor storm flow is to be conveyed with a maximum headwater depth equal to the diameter of the culvert conveying the flow.
    - The major storm flow is to be conveyed with a maximum headwater elevation a minimum of 1-foot below the low point of the road or an elevation required to prevent damages to upstream property.
    - Pipe grades are to be sufficient to achieve a minimum of 3 feet per second (fps) velocity when flowing full.
- Storm Drain Pipe Performance Criteria:
    - Convey the minor storm flow without surcharging.
    - The major storm flow is allowed to surcharge; however, the hydraulic grade line is not to exceed an elevation 1-foot below a manhole rim or inlet flow line.

- Pipes grades are to be sufficient to achieve a minimum of 3 fps velocity when flowing full.
- Street Design Criteria:
  - Minor Storm:
    - All Streets: No overtopping of curbs and containment within street right-of-way or drainage easement.
    - Local Streets: Flow may spread to street crown.
    - Collector Streets: At least one 10-foot lane free of water.
    - Arterial Streets: At least one 10-foot lane free of water in each direction.
  - Major Storm, All Streets:
    - Water surface elevation to be no less than 12 inches below the finished floor elevations of residential dwellings and public, commercial, and industrial buildings.
    - Depth of water to be less than 18 inches at the gutter flow line.
    - Flow to be contained within street rights-of-way or drainage easements.
- Detention Pond Design Criteria:
  - Ponds (or other design elements) are required to limit the developed condition major (100-year) storm discharge to the historic minor (5-year) storm discharge. This is a recent design requirement and most of the detention ponds located within the study area were likely designed using other design standards. Some existing ponds may have been designed to improve water quality and not provide stormwater detention.
  - Ponds are required to feature an overflow spillway capable of conveying the un-detained major storm flow.

6.2 Hydraulic Model Inputs

6.2.1 Design Flows

Design flows for the minor and major storms determined from the hydrologic modeling were used in modeling the hydraulics of the storm drainage infrastructure. Peak flows were used for analysis of culverts, streets, inlets, and storm drain pipes, while hydrographs (flow over time) were used to analyze detention pond performance.

6.2.2 Culvert Parameters

Culvert modeling parameters include the physical parameters identified during the field survey, including pipe invert elevations, length, shape, diameter, and material. Additional parameters include the design flow determined as part of the hydrologic modeling, calculated pipe slope, Manning’s roughness coefficient, allowable headwater depth, and the calculated tailwater depth.

Manning’s roughness coefficient is a measure of the resistance to flow based on the pipe material and varies from 0.015 for smooth interior high density polyethylene (HDPE) pipe to 0.024 for corrugated metal pipe (CMP).

Allowable headwater depths are in accordance with the Town's Design Standards: a headwater depth equal to the pipe diameter for the minor storm and a minimum of 1 foot below the low point on the road or the elevation required to prevent damage to adjacent properties. As discussed above, topographic data lacked sufficient detail to estimate low points on roads or other topographic features. For modeling purposes, the major storm was analyzed assuming a headwater elevation of 1 foot above the top of pipe. The 1-foot submergence is based on an assumption that culverts will typically have a minimum of one foot of cover over the pipe and the typical installation is in a crowned roadway section. This is a conservative approach, as culverts may have more than 1 foot of cover, and culverts showing insufficient capacity for the major storm should be reviewed in more detail to determine if more headwater depth is available.

Tailwater depth was determined by calculating the depth for the design flow in the channel downstream of the culvert using channel parameters estimated from the topographic data. As discussed above, limits in the topographic detail limit the accuracy of these estimations and may result in overly conservative tailwater depth estimates, which may impact the estimated capacity of some culverts.

All culverts were modeled with a generic overflow weir to simulate overtopping a roadway and provide for the continuity of flows in excess of the culvert capacity to downstream basins, given the assumed conditions discussed above. The overflow weir was modeled as either a 20-foot or 40-foot long level section of paved road.

6.2.3 Storm Drain Pipe Parameters

Storm drain pipe modeling parameters include the physical parameters identified during the field survey, including pipe invert elevations, length, diameter, and material. Additional modeling parameters include the design flow, calculated pipe slope and Manning's roughness coefficient. Design flows were a combination of the upstream pipe flows, if any, plus the flow intercepted by inlet(s) located at the upstream end of the pipe. Tailwater depths were based on the headwater depth of the downstream pipe.

6.2.4 Street and Inlet Parameters

Street modeling parameters include street width, longitudinal slope, cross-slope or crown slope, and the presence or absence of curb and gutter. Streets were assumed to have crowned slopes of 2%; longitudinal slopes were determined point-to-point between inlets. Design flows were determined at the design points, typically inlet locations.

Inlet modeling parameters include the physical parameters identified during the field survey, including size of inlet, inlet type (standard inlets are combination inlets with inlet grates located in the gutter pan with curb openings in the face of the curb compared to inlets designated as surface inlets or gutter pan inlets, which are inlet grates, only), grate type (orientation of grate bars), and inlet location (on continuous grade or in a sag/sump condition). Inlet cross-slopes were assumed to be 2%, with longitudinal slopes equal to the street longitudinal slope at the inlet location.

6.2.5 Detention Pond Parameters

Storm drain detention pond modeling parameters include the physical parameters identified in the field survey, including the elevation of the pond bottom and top of pond berm and/or overflow spillway (maximum water surface elevation); outlet pipe invert elevations, pipe diameter, pipe material; and outlet structure details, including orifice diameter, number, and configuration and grate size, type, and elevation, if applicable. Pond areas were generated from survey data provided by the Town and used to develop stage-storage curves for each pond, assuming a linear increase in area with depth. It should be noted that a number of ponds feature outlet pipes that are not located at the bottom of the pond or no outlet pipes at all. These ponds will not empty completely after a storm and drying of these ponds would require evaporation or infiltration between storm events. However, for the purposes of this study, the ponds were assumed to start empty of water prior to the design storm event.

It should be noted that at least two properties (Bayfield Plaza and the former Steamworks property) are known to feature underground tanks designed for stormwater detention/storage. The specifics and functionality of these tanks is unknown and were not considered in the model. In addition, at least two ponds (Pond 21 and Pond 28) appear to have an irrigation function; the actual function for this purpose is unknown and these ponds were modeled as ponds with no outlet.

6.3 Hydraulic Modeling

Hydraulic modeling of storm drainage structures within the study area was completed in conjunction with hydrologic modeling using the Autodesk Storm and Sanitary Analysis modeling software. The data described above, except for flow data, were entered into input files; flow data was transferred within the software from the hydrologic modeling to the design points for hydraulic modeling. Model runs were completed for both the minor and major storms.

Design flows were transmitted from upstream design points and basins to downstream design points and basins. Culverts were analyzed as stand-alone structures using FHWA equations; the pipe length, slope, and diameter; the maximum headwater depth, the assumed tailwater depth; and the design flow.

Streets, inlets, and storm drain pipes are interconnected and analyzed together. Street geometries (longitudinal and cross-slope and width) and design flows at the design points (inlet locations) determine the flow spread (width within the roadway) and depth at the design point. The capture of the street flow by an inlet depends on a number of factors, including primarily whether the inlet is located on grade or in a sump/sag condition. Other factors include the size and number of inlets, the presence of curb openings, and inlet clogging percentage. The Town's design standard for inlet clogging is 50%, which results in a minor reduction in performance, according to HEC-22 calculations. In contrast, SWMM assumes a linear reduction in performance related to inlet clogging. Therefore, SWMM reduces an inlet performance by 50% when 50% clogging is assumed. To avoid overestimating the impact of inlet clogging on inlet performance within the SWMM model, 20% clogging was assumed for all inlets as a conservative estimate, rather than the Town's 50% clogging design standard, which assumes the FHWA's inlet clogging calculation equations.

An inlet on grade may capture only a portion of the street flow if the spread of the flow exceeds the width of the inlet grate. Analysis of an inlet on grade includes an estimation of the flow intercepted by the inlet, as well as the flow that bypasses the inlet. The bypassed flow is transmitted in the model to the next downstream design point, where it is combined with any additional surface runoff that is produced between the design points. Intercepted flow is transferred to the downstream storm drain pipe, where it is added to any upstream pipe flows, and the performance analyzed for the downstream pipe segment.

In contrast, an inlet in sag will intercept 100% of the flow if it is physically possible to achieve the required depth to move the flow into the inlet (the depth is not so great that it overflows the surrounding ground surface to adjacent land at a lower elevation). When an inlet is identified to be in sag in the model, the model will calculate the required depth, whether it is physically possible or not. The flow is then transferred to the downstream storm drain pipe, where it is added to any upstream flows, and the performance analyzed for the downstream pipe segment. A depth significantly deeper than the curb height is an indication that the results should be reviewed more closely to determine if the depth is physically possible or if the flow would overtop the curb and the overflow discharge to a different downstream location.

Pipe performance was analyzed using the hydrodynamic routing method to account for both open channel flow conditions (when pipes are flowing at less than full depth), and pressure flow conditions (when pipes are flowing full at greater than full-flow depth and under pressure head). The Manning's equation, using the Manning's roughness coefficient, the pipe diameter, and the pipe slope, was used to determine the water depth and velocity for both open channel and pressurized flow conditions.

Pond performance was analyzed using specific stage-storage-discharge curves for each pond, together with the inflow hydrograph to the pond. Pipe flow, orifice flow, and/or weir flow calculations, as applicable, were used to develop a discharge curve for each outlet structure. Flows were routed through the pond and ponds with insufficient volume for the inflow transmitted the excess flows downstream as if the pond was overflowing. Excess flows were modeled as an overflow weir.

6.4 Modeling Results

Results of the hydraulic modeling of storm drainage elements within the study area are presented in this section. It should be noted that all results are at the Master Drainage Plan level of analysis. Select parameter values were assumed where detailed topographic data was not available, as discussed in previous sections. The assumed values may be conservative and may result in identification of elements not meeting the Town's design standards that actually do meet the design standards. Additional data and analyses will be required to make this determination.

6.4.1 Culvert Analysis Results

Tables 7 and 8 present the results of the culvert analyses for the 5-year and 100-year storms, respectively. The tables summarize the physical parameters of the pipes and the modeling results. The estimated headwater depth is the key evaluation parameter to determine if the culvert is sufficiently sized in accordance with the Town's Design Standards: if the calculated headwater depth (the depth of water at the inlet end of the culvert required to push the design flow through the pipe) is greater than the allowable headwater depth for the design storm (based on Town Standards), it indicates that the pipe has insufficient capacity for the estimated basin flow and tailwater conditions. Culverts identified as "Investigate" in Tables 7 and 8 are identified as not meeting the design standards and require additional study to verify this result; culverts identified as "Sufficient" meet the design standards even under the conservative parameters assumed in this study and need no additional study.

Table 7 reveals that 49 culverts (64% of the total evaluated) are estimated to not meet the design standards for the 5-year storm and Table 8 reveals that 58 culverts (75% of the total evaluated) are estimated to not meet the design standards for the 100-year storm. The locations of the culverts recommended for additional investigation are shown in Figure 6 for the 5-year storm and Figure 7 for the 100-year storm.

Typically, culverts that meet the 100-year design criteria also meet the 5-year design criteria. However, in rare cases (two culverts), a culvert meets the 100-year storm design criteria but not the 5-year design criteria. This is because the 100-year storm design criteria allow a greater headwater depth for these rare storms compared to the allowable headwater depth for the more frequent 5-year storm.

Table 8 includes a prioritization ranking for culverts recommended for investigation based on how much flow would potentially bypass/overtop the culvert based on the assumed allowable headwater depth (1 foot above the top of the pipe). Those culverts estimated to bypass 50 cubic feet per second (cfs) are ranked “high”, those culverts estimated to bypass between 10 and 50 cfs are ranked “medium”, and those culverts estimated to bypass less than 10 cfs are ranked “low”. As previously discussed, it is possible that some of the culverts recommended for investigation for the 100-year design storm could turn out to have sufficient capacity when analyzed with design level topographic data to more accurately determine the maximum allowable headwater depth.

6.4.2 Storm Drain Pipe Analysis Results

Tables 9 and 10 present the results of the storm drain pipe analyses for the 5-year and 100-year storms, respectively. The tables summarize the physical parameters of the pipes and the modeling results. The estimated headwater depth is the key evaluation parameter to determine if the storm drain pipe is sufficiently sized: if the calculated headwater depth is greater than the allowable headwater depth for the design storm, it indicates that the pipe is not able to convey the estimated flow captured by the upstream inlets and the downstream or tailwater conditions. Storm drain pipes identified as ”Investigate” in Tables 9 and 10 are identified as not meeting the design standards and require additional study to verify this result; pipes identified as “Sufficient” meet the design standards under the estimated analysis conditions.

Table 9 reveals that 42 storm drain pipes (30% of the total evaluated) are estimated to not meet the design standards for the 5-year storm and Table 10 reveals that 60 storm drain pipes (43% of the total evaluated) are estimated to not meet the design standards for the 100-year storm. The locations of the storm drain pipes recommended for additional investigation are shown in Figure 6 for the 5-year storm and Figure 7 for the 100-year storm.

As with culverts, storm drain pipes that meet the 100-year design criteria typically also meet the 5-year design criteria. However, in a number of cases (10 pipes), a storm drain pipe meets the 100-year storm design criteria but not the 5-year design criteria. This is because the 100-year storm design criteria allows a greater headwater depth, which can be significant for pipes connected to deep inlets or manholes, for these rare storms compared to the allowable headwater depth for the more frequent 5-year storm.

Table 10 includes a prioritization ranking for storm drain pipes recommended for investigation based on how much the maximum allowable headwater depth (one foot below the inlet grate) is exceeded. Those pipes with a headwater depth estimated to exceed the elevation of the inlet grate are ranked “high”, those pipes with a headwater depth estimated to be within 6 inches of the elevation of the inlet grate are ranked “medium”, and those pipes within a headwater depth estimated to be 6 to 12 inches below the elevation of the inlet grate are ranked “low”.

6.4.3 Storm Drain Inlet Analysis Results

Tables 11 and 12 present the results of the inlet analyses for the 5-year and 100-year storms, respectively. The tables summarize the physical parameters of the inlets, as well as the peak flow to the inlets. The key evaluation parameters are the maximum gutter spread and the maximum gutter depth during peak flow. The Town’s design standards for the minor storm require at least one 10-foot lane to be free of water for collector and arterial streets and no overtopping of curbs for all streets while the standards for the major storm require the depth of water to be less than 18 inches at the gutter flow line and containment of the flow within street rights-of-way or drainage easements. As previously discussed, the topographic (and right-of-way) information available for this study is not sufficiently detailed to allow detailed analysis of these design parameters. For example, curb height, street cross-slope, gutter depression, street width, right-of-way limits, and other detailed parameters can affect whether the storm drain system meets the design criteria. However, information with this level of detail was not available for each inlet location and the assumptions detailed in Section 6.2.4 were used in inlet analyses. In addition, to evaluate the sufficiency of each inlet, flow depths exceeding 6 inches (0.5 feet) or flow widths exceeding 12 feet (based on a 34-foot wide street) were used as conservative parameters to determine inlets that do not meet the 5-year design criteria. Although the street design criteria allows flooding of streets up to 18 inches deep at the gutter flow line for the major storm event, in many cases the topography within the right-of-way is relatively flat or slopes downward behind the curb and would not allow a flow depth of 18 inches at the gutter flow line. Therefore, flow depths exceeding 6 inches (0.5 feet) or flow widths exceeding 17 feet (based on a 34-foot wide street) were used as conservative parameters to determine inlets that do not meet the 100-year design criteria.

Table 11 reveals that only 24 inlets (20% of the total evaluated) are estimated to not meet the design standards for the 5-year storm and Table

12 reveals that 42 inlets (34% of the total evaluated) are estimated to not meet the design standards for the 100-year storm. The locations of the inlets recommended for additional investigation are shown in Figure 6 for the 5-year storm and Figure 7 for the 100-year storm.

As with culverts and storm drain pipes, inlets that meet the 100-year design criteria typically also meet the 5-year design criteria. However, in rare cases (three inlets), an inlet meets the 100-year storm design criteria but not the 5-year design criteria. In this case, this is because the 100-year storm design criteria allow a greater gutter spread for these rare storms compared to the gutter spread for the more frequent 5-year storm.

Table 12 includes a prioritization ranking for inlets recommended for investigation based on how much the allowable gutter depth (6 inches) is exceeded. Those inlets with a gutter depth estimated to exceed 12 inches are ranked "high", those inlets with a gutter depth estimated to exceed 9 inches are ranked "medium", and those inlets with a gutter depth estimated between 6 and 9 inches are ranked "low. As previously discussed, it is possible that some of the inlets recommended for investigation for the 100-year design storm could turn out to have sufficient capacity when analyzed with design level topographic data to more accurately determine the gutter depth and allowable spread.

6.4.4 Stormwater Pond Analysis Results

Tables 13 and 14 present the results of the pond analyses for the 5-year and 100-year storms, respectively. The tables summarize the physical parameters of the ponds and the peak outflow relative to the peak inflow. Evaluation of ponds relative to the current design standards would require estimation of the pre-development peak flow rate, which would be difficult to determine in retrospect and was beyond the scope of this study. Instead, ponds were evaluated primarily based on whether they are predicted to overtop during the 5-year and 100-year storm events, the magnitude of the estimated overtopping flow, and their estimated functionality in reducing the peak flow from the drainage basin.

Table 13 reveals that 41% (17 of 39) of the ponds within the study area are estimated to overtop during the 5-years storm event and Table 14 reveals that slightly more than half (22 of 39) of the ponds within the study area are estimated to overtop during the 100-year storm event. The Town-owned and jointly-owned ponds function well based on these criteria, with none of the ponds estimated to overtop during either storm event. In this case, the evaluation criteria for the 5-year and 100-year storms is identical (the maximum water surface elevation exceeding the lowest point on the pond berm), so all ponds that are estimated to overtop during the 5-year storm are also estimated to overtop during the 100-year storm. Overtopping indicates that the existing pond volume, combined with the existing outlet structure, is insufficient to contain the design storm. This presents the potential for less controlled release of storm flows over the top of the pond berms. In ponds without reinforced (typically riprap) spillways to protect the berms in the event of an overflow, overtopping could result in rapid erosion and failure of the berms and rapid release of stored water. However, it should be noted that even ponds that overtop can achieve a significant reduction in the peak basin discharge rate. The locations of the ponds that are estimated to overtop are shown in Figure 6 for the 5-year storm and Figure 7 for the 100-year storm.

Tables 13 and 14 reveal that many of the detention ponds are estimated to function quite well for both the 5-year and 100-year storms, respectively. The peak basin discharge rate is estimated to be reduced by 50% or more by 62% (24 of 39) of the ponds for the 5-year storm and approximately half (19 of 39) of the ponds for the 100-year storm, with 9 of the ponds reducing the basin flow by more than 90% for the 100-year storm and several estimated to not discharge at all during the 100-year storm event (functioning as retention ponds). In contrast, nearly one-fourth (9 of 39) of the ponds reduce the peak basin discharge rate by less than 10% for the 5-year storm and slightly more than one-fourth (11 of 39) of the ponds reduce the peak basin discharge rate by less than 10% for the 100-year storm, with several ponds estimated to not reduce the basin flow at all due to the small size and/or undersized outlet structure. The Town-owned and jointly-owned ponds function well based on these criteria, with all three of the ponds estimated to reduce the peak basin discharge by more than 50% for both storm events and the Senior Center pond (Pond No. 38) estimated to reduce the peak basin discharge by more than 90% for the 100-year storm.

Table 14 includes a “Pond Concern Level” ranking for ponds that overtop based on the peak rate of flow estimated to overtop the pond berms during the 100-year storm event. Those ponds with overtopping flows exceeding 20 cfs are ranked “high”, those ponds with overtopping flow exceeding 10 cfs are ranked “medium”, and those ponds with overtopping flows less than 10 cfs are ranked “low”. Based on these criteria, ponds within the study area determined to be of highest concern include Pond Nos. 1 (Dove Ranch), 2 and 3 (High School), and 29 and 30 (Clover Meadows). Other ponds within the study area are also of concern, but the level of concern is less due to lower estimated overtopping flows.

In contrast, a number of ponds in the study area completely detain the relatively large 100-year storm and release the runoff at a much reduced rate. Using criteria of an inflow rate exceeding 10 cfs and an outflow reduction of more than 75%, ponds within the study area identified to perform a significant detention function include Pond Nos. 19 (Shell Station), 23 (Sunrise Estates), 25 (Joint Maintenance Facility), and 31 and

32 (Mesa Meadows). Other ponds within the study area perform well, but either serve smaller basins or achieve lower reduction in discharge rates.

It should be noted that a number of ponds were either designed to function as retention ponds (runoff is discharged through infiltration or evaporation, only), or the outlet pipe/structure has been obstructed with sediment or the outlet pipe/structure was never installed, resulting in ponds designed to function as detention ponds (designed release of runoff through an outlet pipe or structure that drains the pond between storms) to function as retention ponds. Retention of stormwater runoff requires substantially more pond volume than detention of stormwater; therefore detention ponds that are actually functioning as retention ponds are inherently undersized. In addition, the soils in the study area infiltrate slowly, even ponds that are adequately sized to retain runoff from the major storm may not have sufficient volume available to retain a subsequent storm because the pond is already full of water. Modeling of sequential storms would likely show that many of the ponds functioning as retention ponds would overtop with a second storm event.

7.0 – Preliminary Budgetary Costs for Storm Drainage Infrastructure Improvements

Unit prices for developing preliminary budgetary costs are based on prices obtained from recently bid projects in the region and actual block-to-block construction contract prices from area communities. Actual costs will depend on the scale of the project, with smaller scale construction projects being relatively more expensive and larger scale construction projects being relatively more cost-effective. Costs are present value and do not include inflation factors for completing construction in the future. Budgetary construction costs were increased by 30% to account for engineering and contingency. Detailed quantities and current prices should be used as design solutions are developed.

7.1 Budgetary Costs for Culvert Improvements

Budgetary costs were developed for culverts recommended for investigation based on not satisfying the 100-year design criteria. These culverts may or may not also meet the 5-year design criteria, but the most critical criteria were assumed to be the 100-year design criteria due to the greater safety hazard and property damage potential of the higher flows associated with the major storm event. To develop budgetary costs, culverts recommended for investigation were assumed to be replaced with a pipe 6 inches larger in diameter, with a minimum pipe size of 18 inches in diameter.

Culverts recommended for investigation and budgetary costs associated with replacement for culverts with high, medium, and low priorities are shown in Table 15. Budgetary costs total $176,000 for high priority culverts, $132,000 for medium priority culverts, and $95,000 for low priority culverts. Total budgetary costs for culverts recommended for investigation are estimated to be approximately $403,000.

7.2 Budgetary Costs for Storm Drain System Improvements

Storm drain system deficiencies may consist of not meeting the depth or spread of flow at the gutter, a function of inlet number and spacing, or surcharging of pipes to depths exceeding the design criteria, a function of the pipe size, slope, and material and the flow intercepted by inlets and the flow from upstream storm drain pipes. Resolution of these deficiencies is not a straightforward design solution. For example, adding an inlet to a storm drain system that results in the capture of additional runoff can cause a pipe section that is currently determined to be sufficient to become deficient because of the additional flow it now must convey; this impact can also be transferred to additional downstream pipes. For another example, adding an upstream inlet to a storm drain system may reduce the bypass flow enough so that a downstream inlet currently identified as deficient will meet the design criteria due to the reduction in gutter flow approaching the inlet; this impact can also be transferred to additional downstream inlets. Development of specific recommendations for number and location of additional inlets and increased pipe sizes therefore requires detailed design analysis.

In order to develop reasonable budgetary costs for storm drain system improvements, the following assumed costs were included for elements identified to be investigated:

1. The full value of one additional inlet for each inlet identified to be investigated.
2. The full value of increased-size pipes (increased by 6 inches from existing) for each pipe identified to be investigated.
3. 50% of the value of increased-size pipes (increased by 6 inches from existing) for each pipe currently determined to be sufficient that is located below inlets identified to be investigated in order to account for the possibility that the increased inlet capture will cause these pipes to become deficient.

Storm drain systems recommended for investigation and budgetary costs associated with replacement are shown in Table 16. Budgetary costs total $1,240,000 for high priority storm drain systems, $335,000 for medium priority storm drain systems, and $179,000 for low priority systems. Total budgetary costs for storm drain systems recommended for investigation are estimated to be approximately $1,754,000.

Improvements to the Lower Dove Ranch storm drain system to address the known deficiencies identified in Section 4.10, consisting of extension of the piped storm drain system under CR 501 and the Schroeder Ditch and then to the Los Piños River via an open channel, were planned by the subdivision developer. The cost for completion of these improvements was estimated at $300,000 several years ago; we recommend the Town budget a minimum of $450,000 for these improvements to account for inflation of construction costs and additional engineering design and permitting (if needed). It is our opinion that this is the highest priority storm drainage improvement that the Town needs to consider, given the current discharge of undetained flows from the subdivision and the potential for damage to the irrigation ditch and downstream properties. Including these improvements in budgetary costs increases the cost to $1,690,000 for high priority storm drain systems and $2,204,000 for all storm drain systems recommended for investigation.

An alternative to the uncompleted Dove Ranch Subdivision storm drain improvements would be to intercept off-site runoff (and possibly the stormwater runoff and storm drain flows from the upper portion of the Dove Ranch Subdivision) that currently contributes to the discharge under CR 501 and to the Schroeder Ditch and detain the flows in a detention pond located at the lower end of Dove Ranch on currently undeveloped land. This would require purchase of land and/or easements for the detention pond, as well as any modifications to the existing storm drain system to reroute flows to the detention pond, plus it is possible that the Ditch Company would still require installing a piped system under the Schroeder Ditch in order to eliminate stormwater impacts to the ditch. If the Town could negotiate discharge of the detained stormwater flows (at or below historic discharge rates) to the Schroeder Ditch with the Ditch Company, this alternative might be a viable, cost-effective alternative to the uncompleted improvements planned for the subdivision storm drainage system.

7.3 Budgetary Costs for Detention Pond Improvements

Recommendations for detention pond improvements are necessarily limited because the ponds are private infrastructure, were generally designed to varying design standards and previously approved by the Town, and it is unlikely that the Town could retroactively require the ponds to be modified to current design standards, nor would it be physically possible in most cases. Therefore, the principal recommendations for ponds is cleaning of sediment deposition and excess vegetation on a regular basis and construction of reinforced overflow conveyances for ponds that do not currently include this feature.

Cleaning of ponds is necessary to maintain the designed volume and provide the designed detention function. Many ponds experience a large amount of sedimentation during construction and before paved surfaces or site vegetation is established but this soil has generally not been cleaned out after the site is stabilized. This results in a reduction in volume of the ponds, which provides less detention volume than designed and may cause the design storm to overtop rather than be detained as designed. Small ponds, in general, are more sensitive to reduction in volume as a result of sedimentation. In extreme cases, outlet pipes or structures have apparently been buried by sediment, which obstructs the discharge of water through the outlet structure, converting a detention pond to a retention pond. In these cases, the ponds do not have nearly sufficient capacity to function as retention ponds, which will likely result in overtopping of the ponds during a storms that the ponds were designed to retain. Based on site visits, nearly a quarter of the stormwater ponds within the study area were identified as needing cleaning, either to remove accumulated sediment and/or vegetation, primarily cattails or similar wetland-type vegetation or small trees and shrubs. The ponds recommended for cleaning are identified in Table 17.

A reinforced overflow conveyance, typically a riprapped spillway, provides a semi-controlled and erosion-resistant flow path in the event a storm exceeds the design capacity of a pond or the outlet structure becomes obstructed. Ponds without such a feature are susceptible to erosion of the pond berm during an overflow event and overtopping could cause failure of the berm, release of a large volume of water over a short period of time, and flooding of downstream properties. More than 40% of the stormwater ponds within the study area appear to not have a reinforced overflow conveyance, as shown in Table 17.

Although none of the existing ponds are considered to be Town infrastructure, budgetary costs for pond cleaning and construction of overflow weirs are provided in Table 17 in the event the Town decides to assist in the maintenance of detention ponds as part of maintenance of the Town's storm drainage infrastructure. The total cost for pond cleaning and weir construction costs identified in this study is estimated to be approximately $62,000. It may be that a portion of these costs, particularly removal of sediment and vegetation from the ponds, could be completed or at least partially reimbursed by the pond owner. Ultimately it is in the pond owner's interest to properly maintain the ponds because they could be held liable if damage from stormwater discharge occurs to downstream properties and it can be shown that the pond owner did not properly maintain the pond.

8.0 – Conclusions

The modeling results for storm drainage elements in this report should be considered together with the following considerations:

1. The boundaries of basins discharging to elements identified for further investigation should be confirmed. Delineation of basin boundaries at the level of this MDP may have missed subtle divisions of boundaries that could impact the results. Basin boundaries should be confirmed in order to confirm the design flows to the suspect elements.
2. Missing or suspect information (missing invert elevations, assumed storm drain pipe connections, and similar) should be confirmed prior to completing additional hydraulic analyses.
3. Ownership of storm drainage infrastructure should be identified to assess responsibility for maintenance and recommended upgrades. It is likely that some of the culverts, storm drain pipes, and inlets adjacent to CR 501, CR 521, and Highway 160 belong to, and are the responsibility of either La Plata County or the

Colorado Department of Transportation. Budgetary costs provided in this section should be adjusted based on ownership of infrastructure elements by others.

4. Additional detailed topographic information should be obtained in order to verify through detailed hydraulic analysis that the elements identified for further investigation are actually deficient and the deficiency is not a result of conservative assumptions made in the absence of detailed topographic information.
5. Actual sizes and locations of replacement culverts, storm drain pipes, and additional inlets should be determined through a detailed hydraulic analysis and engineering design process. Culvert and storm drain pipe sizes and additional inlets are estimated in this study for preliminary budgeting purposes, only. Costs should be refined as actual design solutions are developed. The feasibility of the recommended size, e.g. adequate cover over the larger pipe, lack of conflict with other underground utilities, and similar, should be verified during the design process.

8.1 Other Observations

8.1.1 Interception of Flows by Irrigation Ditches

The study area includes several significant irrigation ditches that currently intercept storm water runoff. These ditches comprise a critical function in the storm water system because the runoff they intercept is storm water that the Town's storm drainage infrastructure does not have to capture and convey to alternate discharge points. It is likely that the ditches will be piped at some point in the future. When and if this occurs, the Town will need to ensure that the storm water runoff is allowed to continue to discharge to the irrigation conveyance facilities as it has done historically. If this provision is not provided, it will require significant upgrades to the Town's storm drainage system to capture and convey the runoff that previously discharged to the ditches in order to avoid impacts to downstream properties that have not historically received this runoff.

8.1.2 Town Storm Drainage System Infrastructure Design Standards

The Town's current storm drainage system infrastructure design standards for storm water detention are conservative in nature. The Standards require the 100-year storm runoff from the developed site to be released at the 5-year storm runoff from the pre-developed site. This standard will actually reduce peak flows that the Town's storm drainage infrastructure has to convey as infill development continues within the study area.

8.1.3 Regional Detention Ponds

The Town has historically developed with individual property owners and/or subdivision owners developing detention ponds to serve individual properties or subdivisions. This has resulted in a large number of very small ponds, some of which are of limited functionality. Because they are privately owned, the Town has limited control regarding maintenance of the ponds, including removal of sediment and vegetation. The most egregious example of this condition is the Bayfield Center Subdivision. This subdivision would be much better served with a pond serving the entire subdivision, and possibly other adjacent properties. An alternative approach is the creation of regional ponds that serve multiple properties and/or developments, with the ponds considered Town infrastructure, so that the Town has control of maintenance of the ponds. These ponds are also likely to provide a better detention function than multiple small ponds. However, regional detention ponds would require acquisition of property to serve the existing portions of Town and there are limited undeveloped properties within Town where the ponds would serve a useful function. Bayfield Center Subdivision is the principal development that this could be considered. However, this study did not attempt to determine a cost for a Bayfield Center pond, given the current partial buildout that has already occurred with each parcel developing a private detention pond. However, it is highly recommended that the regional pond approach be considered when areas outside of the study area begin to develop, particularly on the northeast side of Town. This will require coordination among property owners and the Town may want to consider a special storm drainage infrastructure district with associated fees as a means to fund property acquisition and construction of a regional pond in these cases.

8.1.4 Maintenance of Storm Drainage Infrastructure

A number of culverts were clogged with sediment and required digging out before survey data could be collected for the pipes. In addition, a number of detention ponds have accumulated significant amounts of sediment, to the point of reducing the pond volume and/or obstructing the outlet pipe/structure. Due to the nature of development in the Town, i.e. limited curb and gutter, numerous earthen ditches, numerous culverts and drainage pipes, numerous small private detention ponds, numerous area drains in highly vegetated settings, and many more similar features, maintenance demands of storm drainage infrastructure on Town staff is significant. Maintenance of private detention ponds is presumably the responsibility of the property owner or subdivision Homeowner Associations (HOAs), for which the Town has little control. Yet proper maintenance, i.e. regular and periodic cleaning and repair of pipes, cleaning of detention ponds and associated piping, clearing and cleaning of grated inlets, cleaning and maintaining earthen ditches, repair of curbs and gutters, etc., is essential to keeping the system functioning properly and at its design capacity. A regular maintenance program by the Town of Town-owned infrastructure, together with inspection of privately-owned detention ponds, should be implemented by the Town. The detention pond inspection program should have the ability for the Town to perform or hire the pond maintenance and get reimbursed if the pond owner does not perform the required maintenance in a timely manner.

8.2 Limitations

This document was prepared solely for the Town of Bayfield, Colorado in accordance with professional standards at the time the services were performed and in accordance with the contract/Work Order between the Town of Bayfield and Souder Miller and Associates (SMA). This document is governed by the specific scope of work authorized by the Town of Bayfield; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. SMA has relied on information or instructions provided by the Town of Bayfield and other parties and, unless otherwise expressly indicated, has made no independent investigations as to the validity, completeness, or accuracy of such information except as noted herein.

This document was prepared as a Master Planning Document and is not intended to be and should not be considered or inferred to be design level documentation. Any recommendations made herein are presented as planning level recommendations. Advancing any recommendations to project implementation will require additional engineering analysis and design effort.

8.3 Engineer's Certification

I, Brent A. Adams, a duly registered professional engineer in the State of Colorado, have supervised the preparation of this Master Drainage Plan. The information included is, to the best of my knowledge, accurate and consistent with professional practices in the State of Colorado.

COLORADO LICENSED
BRENT A. ADAMS
40048
9/30/14
PROFESSIONAL ENGINEER

Brent A. Adams, P.E.
Registration # 40048

Tables

Table 1
Existing Culvert Inventory

Pipe No.	Pipe Location	Material Type	Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
1	CR 501 crossing south of Dove Ranch Rd., SW corner of subdivision	CMP	24	52.06	7007.37	7001.64	11.01%	
2	Crossing of Mountain View Dr between N. Wilmer Dr. and Dove Ranch Rd, close to S boundary of Subdivision	CMP	24	39.67	7058.59	7057.06	3.86%	
3	Crossing of Mountain View Dr midway between N. Wilmer Dr. and N. Wilmer Dr.	CMP	18	39.45	7055.33	7054.70	1.60%	
6	Parallel and W side of Mountain View, immediately N of irrigation ditch S of E Cedar Dr.(Drwy cross)	CMP	18	41.63	7041.24	7039.88	3.27%	Survey notes indicate 18", Town notes indicate 20"
7	Cross E Cedar Dr W of Pinon Ct.	CMP	15	85.44	7045.89	7043.23	3.11%	
8	Cross N Pinon S of E Cedar St	CMP	15	33.76	7047.30	7046.43	2.58%	
9	Cross N Tamarack @ Cedar Dr.	CMP	18	59.27	7066.54	7065.09	2.45%	Survey note indicate 1-18", Town notes indicate 2-16" Pipes
10	Cross N Cactus Dr @ Juniper St.	CMP	24	59.52	7088.96	7088.26	1.18%	
11	Cross Sage St @ Cactus Dr.	CMP	24	36.2	7078.77	7076.56	6.10%	
12	Crosses N. Tamarack @ Cactus Dr.	CMP	24	32.87	7072.64	7072.54	0.30%	
13	Crosses Palo Verde Dr. @ N Oak Dr.	CMP	18	39.82	7096.14	7093.98	5.42%	
15	Crosses Cedar Dr @ N Oak Dr.	CMP	12	63.54	7080.28	7075.33	7.79%	
16	Crosses E Oak Dr. S of School's baseball field	CMP	18	73.79	7035.20	7031.04	5.64%	
17	Crosses E Oak @ Mountain View	CMP	18	93.38	7011.66	7007.26	4.71%	Not clear where this pipe discharges, Town indicates it needs to be videoed
19	Crosses Mountain View @ Columbine Dr	CMP	12	51.12	7004.98	7004.89	0.18%	
20	Crosses Columbine Dr @ Mountain View	CMP	18	39.67	7004.54	7003.65	2.24%	
21	Crosses E Schroder Dr. W of Mountain View	CMP	12	39.74	6996.85	6996.16	1.74%	
22	Crosses E Schroder Dr. E of Mountain View	CMP	15	39.04	6996.21	6996.04	0.44%	
24	Under walking trail, E side of CR 501, N of Sossamon Rd.	CMP	8	26.88	6992.57	6991.96	2.27%	
25	Crosses under N driveway to High school parking lot	CMP	15	39.62	6984.50	6983.07	3.61%	
26	Crosses under Sossamon Rd at CR 501	CMP	15	43.85	6989.10	6988.08	2.33%	
27	Cross under trail E side of CR 501 between N and S driveways to High School.	CMP	24	35.77	6980.23	6979.62	1.71%	
28	Crosses under CR 501 between driveway to the High school off of CR 501	CMP	24	48.43	6982.00	6979.30	5.58%	Upstream end silted, invert elevation assumed, invert elevation are confusing
29	Crosses under the S driveway to High School	CMP	24	97.63	6977.45	6975.57	1.93%	
30	Crosses under CR 501 West of High School, SW of High School Campus	CMP	24	87.02	6967.35	6962.00	6.15%	Downstream end silted, invert elevation assumed

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Existing Culvert Inventory

Pipe No.	Pipe Location	Material Type	Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
46	Crossing of Willow Dr @ Mountain View, east side of Mountain View	CMP	12	46.08	6985.84	6985.00	1.82%	
47	Crossing Dakota Dr. W side of Mountain View	CMP	12	44.79	6979.24	6978.43	1.81%	
48	Water haul station N driveway, E side of Mountain View	CMP	15	23.58	6976.02	6975.55	1.99%	
49	Spruce Dr. crossing E side of Mountain View	CMP	15	54.52	6973.39	6972.70	1.27%	
50	Water haul station S driveway off Spruce Dr.	CMP	15	39.82	6974.80	6973.68	2.81%	
54	W side of Mountain View, driveway into shopping center N of Colorado Dr	CMP	12	42.65	6966.21	6965.66	1.29%	
55	Crosses Colorado Dr at Mountain View	CMP	12	51.59	6963.58	6963.43	0.29%	
60	Crosses CDOT Hwy 160 E of Commerce Dr.	CMP	24	106.96	6960.69	6959.82	0.81%	
61	Crosses Appaloosa Ln N of the intersection w/Bayfield Parkway	CMP	15	35.69	6955.39	6955.21	0.50%	
63	Crosses Bayfield Parkway between Appaloosa Ln and S Mesa Ave.	CMP	24	46.36	6952.36	6951.70	1.42%	
65	Crosses Bayfield Parkway W of Mesa Dr.	CMP	24	49.9	6946.01	6945.30	1.42%	
66	Crosses trail N of CDOT 160, E of CR 501	CMP	36	21	6938.72	6937.79	4.43%	
67	Crosses CDOT 160 ROW E of CR 501 and 160 intersection	CMP	24	163.25	6934.55	6933.10	0.89%	
68	Crosses trail N of CDOT 160, E of CR 501	CMP	18	59.78	6938.17	6937.74	0.72%	
73	Crosses Bayfield Parkway at W Park St	CMP	18	70.13	6886.86	6885.60	1.80%	
79	Crosses S loop of S Los Pinos Dr E of S Mesa Ave	CMP	24	43.84	6935.21	6934.96	0.57%	
80	Along rear lot line, S of Los Pinos Dr.	CMP	24	135.47	6934.73	6933.44	0.95%	
83	Crosses Meadow Circle @ (N loop)of Clover Dr.	CMP	24	49.98	6956.44	6954.90	3.08%	
84	Crosses Meadow Circle (N loop) of Clover Dr.	CMP	24	70	6949.89	6948.93	1.37%	
86	Crosses Lupine Dr E of Clover Dr.	HDPE	18	179.61	6954.31	6951.71	1.45%	
86A	N of Lupine Dr. rear lot line S toward street	HDPE	12	53.07	6955.90	6954.73	2.20%	
90	Crosses Clover Dr. @ Bayfield Parkway	CMP	18	59	6980.85	6979.22	2.76%	
100	Crosses walking trail N of Bayfield Center Dr. @ Wolverine Dr.	CMP	12	19.66	6962.29	6962.09	1.02%	
101	Crosses under walking trail between Bayfield Center Dr. and driveway entrance	CMP	12	19.31	6962.47	6962.44	0.16%	
102	Crosses Wolverine N of Bayfield Center Dr.	CMP	18	60.19	6960.74	6960.02	1.20%	
103	Crosses walking trail W of Wolverine, N of Bayfield Center Dr.	CMP	12	19.82	6958.78	6958.62	0.81%	
104	Crosses walking trail W of major N-S drainage swale, N side of Bayfield Center Drive	CMP	12	39.81	6953.73	6953.42	0.78%	
105	Crosses under walking trail and Bayfield Center Dr. half way between Wolverine and Sower Dr.	CMP	36	110.75	6951.48	6950.76	0.65%	

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Existing Culvert Inventory

Pipe No.	Pipe Location	Material Type	Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
106	Passes through berm N of Bayfield Center Dr. in major N-S drainage swale half way between Wolverine and Sower Dr.	CMP	24	19.52	6952.96	6952.63	1.69%	
107	Crosses Sower Dr, and walking trail W of Wolverine	CMP	36	85.83	6959.45	6958.63	0.96%	
109	Crosses walking trail W side of Sower Dr, N of Bayfield Center Dr.	CMP	12	19.52	6959.46	6959.16	1.54%	
112	Crosses trail E side of CR 501, half way between CDOT 160 and Bayfield Center Dr.	CMP	24	57.72	6943.22	6941.21	3.48%	
113	Crosses under walking trail E side of CR 501 N of CDOT 160	CMP	24	44.08	6935.44	6935.03	0.93%	
123	Crosses N loop of S Los Pinos Dr E of Mesa Ave	CMP	18	47.73	6947.11	6946.03	2.26%	
138A	Crosses driveway on E end of East Dr, N side of East Dr.	CMP	15	41.95	6881.11	6880.19	2.19%	
139A	Crosses E end of East Dr.	CMP	18	39.78	6873.34	6872.30	2.61%	
142	W South St at the S West St intersection	CMP	24	55.17	6864.34	6863.96	0.69%	
142A	Crosses driveway W of Buck Hwy below Pipe 141A	CMP	12	24	6885.96	6885.35	2.54%	
143	Crosses Mars Dr. N of Buck Hwy	CMP	12	70.89	6892.56	6890.29	3.20%	
144	Crosses S Mesa Dr diagonally at Mustang Dr.	CMP	12	89.47	6923.31	6921.27	2.28%	
145	Crosses Mustang Dr. @ Mars Dr., W side	CMP	24	49.72	6919.00	6918.27	1.47%	
145A	N side of intersection of Mars and Mustang,	CMP	18	19.71	6920.99	6920.34	3.30%	
149	Crosses Louisiana Dr E of Mars Dr.	CMP	24	72.68	6904.91	6902.78	2.93%	
170	Crosses Clover at Mustang	CMP	15	53.99	6939.00	6938.54	0.85%	
172	Crosses Mustang just W of Clover	CMP	24	38.92	6940.48	6940.26	0.57%	
177	Crosses Mars @ Buck Hwy	CMP	15	59.99	6886.34	6884.22	3.53%	
178	Crosses Buck Hwy at Mars	CMP	24	55.19	6878.76	6877.70	1.92%	
210	Crosses through berm at the NE corner of Pond 36 & Mustang & Mars)	HDPE	8	19.96	6919.44	6919.12	1.60%	
221	NE Corner of Mars and Buck Hwy	CMP	12	23.54	6883.11	6882.93	0.76%	
222	E side of Buck Hwy, N of Mars	CMP	12	22.68	6888.22	6887.68	2.38%	
223	Crosses Buck hwy N of Mars Dr.	CMP	15	34.08	6887.81	6887.26	1.61%	
224	W side of Buck Hwy, N of Mars	CMP	15	15.63	6887.26	6887.20	0.38%	

Table 2

Existing Storm Drain Pipe Inventory

Pipe No.	Pipe Location	Material Type	Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
4	West side of Mountain View, starting on N. side of E. Cedar Dr. running S. to inlet	CMP	12	65.26	7052.40	7047.46	7.57%	
4A	West side of Mountain View, starting on S. side of E. Cedar Dr. at inlet then S. to open ditch	CMP	18	164.11	7047.46	7043.68	2.30%	Survey notes indicate 12" and 18", Town note indicate 20"
14	Crosses Palo Verde in curve N of N Oak Dr.	CMP	12	183.68	7097.40	7085.46	6.50%	
18	Crosses Lakeside Dr. at Mountain View	CMP	12	38.46	7011.74	7010.24	3.90%	
18A	Crosses Mountain View S of E Oak Dr.	CMP	12	93.22	7010.24	7007.26	3.20%	Not clear where this pipe discharges, Town indicates it needs to be videoed
23A	Crosses Westview & Lakeside @ Lakeside to WTP	CMP	12	150.99	7008.41	6997.33	7.34%	Outlet silted closed
23B	SW corner of the WTP	CMP	12	113.77	6997.33	6991.37	5.24%	Town notes indicate this pipe is capped, but saw drainage into irrigation ditch. Inlet silted closed
31	S from south side of Sossamon, W of Mountain View	CMP	12	150.33	7046.92	7034.00	8.59%	
32	Parallel to Sossamon, south side of street, between inlets	CMP	12	125.5	7048.46	7046.92	1.23%	
33	W of Mountain View S boundary of Dove Ranch subdivision, S of Dove Ranch Rd	HDPE	36	364.62	7056.62	7043.90	3.49%	Upstream invert not provided, not sure this pipe exists
34A	From N.stub street between Taylor Cir and Mountain View, south to S subdivision bdry	HDPE	24	167.9	7055.90	7043.90	7.15%	
34B	N side Mountain View, connecting inlet to pipe 34	HDPE	24	18.95	7056.09	7055.90	1.00%	
34C	N side Mountain View, connecting inlet to pipe 35	HDPE	24	18.95	7056.14	7055.90	1.27%	
35	S of Dove Ranch Rd, W of Mountain View, E of Pipe #37, along S boundary of subdivision	HDPE	36	274.08	7043.90	7033.29	3.87%	No information provided
37	South boundary of subdivision, immediately east of Pipe #38	HDPE	36	96.07	7033.29	7028.34	5.15%	No information provided
38	South boundary of subdivision immediately east of detention Pond #1	HDPE	36	581.39	7028.34	7000.90	4.72%	No information provided
39A	Cross SW corner Taylor Circle to detention pond # 1	HDPE	18	124.89	7009.67	7000.90	7.02%	Invert and pipe information in question
39B	SW corner of Taylor Circle, connects inlet on n side to pipe 39A	HDPE	18	35.33	7010.21	7009.67	1.53%	
40	S side of Dove Ranch Rd, E side of Mountain View to south lot line of subdivision	HDPE	24	135.26	7059.47	7056.62	2.11%	Information not provided, what is provided does not match what is on the ground
41	Connects curb inlets at Dove Ranch Rd and Mountain View	HDPE	24	44.91	7059.87	7059.47	0.89%	
41A	Crosses Mountain View S of Dove Ranch Rd at S lot line of the subdivision	HDPE	36	75.59	7059.84	7056.62	4.26%	
42	Crosses Dove Ranch Rd @ Cactus Dr	HDPE	24	39.77	7125.75	7125.31	1.11%	

Table 2

Existing Storm Drain Pipe Inventory

Pipe No.	Pipe Location	Material Type	Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
43	W side of Cactus Rd S of Dove Ranch Rd, S of intersection of streets	HDPE	24	122.19	7125.31	7122.14	2.59%	
44	Cross Cactus Dr S of Dove Ranch Rd @ S subdivision boundary	HDPE	36	96.01	7126.62	7122.14	4.67%	
51	N side of Bayfield Center Dr. W of Mountain View intersection	CMP	12	161.52	6969.40	6969.00	0.25%	Discharge end silted closed
52	Crossing of Bayfield Center Dr., W side of Mountain View	CMP	12	69.42	6969.00	6968.57	0.62%	inlet end silted closed
53	W side of Mountain View immediately S of Bayfield Center Dr.	CMP	12	65.85	6968.57	6967.58	1.50%	
56	Parallel to and N Side of Colorado Dr., W of Mountain View	CMP	15	108.89	6962.79	6962.16	0.58%	
57	Crosses Colorado Dr. E of Commerce Dr.	CMP	18	59.84	6962.82	6962.15	1.12%	
58	N Side of Colorado Dr., E of Commerce Dr.	CMP	15	77.08	6962.16	6962.30	-0.18%	
59	N side of Colorado Dr., immediately E of Commerce Dr.	CMP	18	35.82	6962.54	6962.39	0.42%	
69	Crosses driveway into convenience store/gas station, E of CR 501, S of CDOT 160	CMP	21	88.4	6919.08	6910.11	10.15%	
69A	Crosses driveway into convenience store/gas station, E of CR 501, S of CDOT 161	CMP	10	78.79	6923.80	6910.11	17.38%	
69B	Parallel to CR 501 S of driveway into convenience store/gas station	CMP	21	50.8	6917.92	6910.11	15.37%	
69C	Convenience store/gas station parking lot SW corner	CMP	10	21.58	6923.29	6910.11	61.08%	
70	Crosses CR 501 just N of Bayfield Parkway	CMP	30	127.99	6910.11	6906.73	2.64%	Material type not confirmed
72	Crosses Buck Hwy at Bayfield Parkway	CMP	24	112.3	6903.33	6900.73	2.32%	
72A	Connects inlet 26 to inlet 28	CMP	24	4.87	6905.55	6903.33	45.59%	
74	W side of Buck Hwy between W North St and W Park St	CMP	24	161.71	6897.40	6891.53	3.63%	
75	Crosses Buck Hwy just N of Church St	CMP	24	34.63	6897.56	6897.40	0.46%	No invert on the upstream end
76	E side of Buck Hwy between Church St and Bayfield Parkway	CMP	8	259.2	6900.82	6898.47	0.91%	No inverts provided
77	E side of Buck Hwy between Church St and Bayfield Parkway	CMP	8	149.76	6902.07	6900.82	0.83%	No inverts provided
78	E side of Buck Hwy between Church St and Bayfield Parkway	CMP	8	452.83	6905.55	6902.07	0.77%	Notes indicate this section could flow S to N, no inverts provided
85A	N of Day Lily E of Clover Dr	CMP	18	11.69	6948.90	6948.32	4.96%	
85B	Crosses Day Lily E of Clover Dr.	CMP	18	30.87	6948.32	6948.32	0.00%	
85C	S of Day Lily E of Clover Dr	CMP	18	33.47	6948.32	6947.85	1.40%	

Table 2

Existing Storm Drain Pipe Inventory

Pipe No.	Pipe Location	Material Type	Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
88A	W side of the Joint Maintenance Facility Yard	CMP	18	58.69	6971.66	6970.88	1.33%	
88B	Connects Inlet 41 to inlet 42	CMP	18	206.36	6970.88	6966.18	2.28%	
88C	Connects Inlet 42 to inlet 43	CMP	18	54.68	6966.18	6964.88	2.38%	
89	E of Detention pond # 25	CMP	15	72.1	6966.99	6965.56	1.98%	
92	Crosses Kremer Dr.@ Cinnamon Dr	HDPE	18	201.71	7016.40	7011.97	2.20%	
93	Crosses Kremer Dr. W side of Cinnamon Dr	HDPE	18	46.06	7013.15	7012.53	1.35%	
94	N edge of Kremer Dr. W of Cinnamon Dr	HDPE	18	139.27	7012.53	7011.02	1.08%	
95	N edge of Kremer Dr into detention pond #20	HDPE	18	59.59	7011.02	7009.89	1.90%	
96	SW corner of Full Moon Circle to detention pond # 23	CMP	18	73.5	6988.96	6987.66	1.77%	
96A	Full Moon Circle from Kremer Dr.	CMP	18	161.25	6990.89	6988.96	1.20%	
97	S of Half Moon Circle and Kremer Dr. intersection	CMP	18	147.37	6992.44	6991.02	0.96%	
97A	Crosses Kremer Dr. S of Half Moon Circle	CMP	15	34.21	6993.04	6992.70	0.99%	
98	Rear lot line E of Kremer Dr. S of Half Moon Circle	CMP	18	62.87	6991.02	6990.54	0.76%	
110	N side of traffic circle @ Bayfield Center Dr, CR 501	CMP	24	113.18	6950.12	6948.08	1.80%	
110A	NE side of traffic circle behind curb	CMP	24	20.06	6949.65	6948.08	7.83%	
111	E side of traffic circle S on E side of CR 501	CMP	24	243.65	6948.08	6947.12	0.39%	
111A	E side of CR 501 S of traffic circle	CMP	24	201.67	6947.12	6945.64	0.73%	
114	Crosses CR 501 @ CDOT 160 N side	CMP	48	164.36	6918.33	6907.66	6.49%	
115	From Inlet in Cinnamon Dr to pond #22	CMP	18	101.78	7013.00	7011.40	1.57%	
118	Crosses Kremer Dr just E of Bayfield Parkway, south of CDOT 160	CMP	12	44.78	7005.57	7003.60	4.40%	
119	N side of Kermer Dr, E of Bayfield Parkway, S of CDOT 160	CMP	12	32.39	7003.60	7001.32	7.04%	
121	E side of CR 501, N of CDOT 160	CMP	36	98.33	6919.71	6918.33	1.40%	
121A	E side of CR 501, N of CDOT 160	CMP	18	46.9	6920.44	6918.33	4.50%	
122	E side of CR 501, N of CDOT 160	CMP	18	65.65	6922.81	6918.33	6.82%	
123A	E side of Buck Hwy between W North St and W Park St	CMP	8	121.96	6898.47	6897.18	1.06%	
124	E side of Buck Hwy between W North St and W Park St	CMP	8	167.3	6897.18	6895.48	1.02%	
125	E side of Buck Hwy between W North St, E Mill St	CMP	8	107.48	6895.48	6892.34	2.92%	
126	E side of Buck Hwy between W North St, E Mill St	CMP	8	199.27	6892.34	6890.63	0.86%	
127	E side of Buck Hwy N of E Mill St	CMP	8	248.24	6894.32	6890.63	1.49%	
128	Crosses Buck Hwy just N of E Mill St	CMP	15	29.7	6890.89	6890.46	1.45%	
129	W side of Buck Hwy just N of E Mill St	CMP	24	79.13	6890.46	6890.38	0.10%	
130	Crosses E Mill St at a NE to SW diagonal	CMP	24	189.04	6890.38	6879.40	5.81%	
131	Crosses E Mill St @ S East St	CMP	15	55.82	6882.27	6879.40	5.14%	

Table 2

Existing Storm Drain Pipe Inventory

Pipe No.	Pipe Location	Material Type	Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
132	S side of E Mill St W of S East St across Church St	CMP	24	390.65	6879.40	6877.93	0.38%	
133	S side of E Mill St W of Church crossing Pearl St to point of curve in E Mill St	CMP	24	688.94	6877.93	6873.64	0.62%	
134	Crosses E Mill St @ alley E of Bayfield Parkway	CMP	18	57.78	6874.89	6873.64	2.16%	
135A	Crosses Buck Hwy at E South St	CMP	21	30.59	6887.19	6886.73	1.50%	
136A	Crosses E South St W of Buck Hwy	CMP	15	114.47	6886.73	6885.38	1.18%	
137	Crosses South St W of S East St	CMP	8	38.74	6875.63	6875.16	1.21%	
138	Crosses W South St, W of Church St	CMP	15	38.53	6874.95	6874.89	0.16%	There is a manhole not recorded by survey
139	N side of South St W of S East St	CMP	18	293.77	6875.16	6874.89	0.09%	
140A	Diagonally crosses South St to intersection w/S West St	CMP	24	555.81	6874.89	6865.40	1.71%	
141A	Crosses Buck hwy N of Mars Dr.	CMP	18	60.77	6896.26	6893.66	4.28%	
146	Crosses Fox Farm Circle, S of Mustang Dr.	CMP	12	35.61	6922.18	6921.65	1.49%	
147	From E side Fox Farm Circle to Pond #36	CMP	12	34.87	6921.65	6919.38	6.51%	
148	Under walking trail between apartments to detention pond	HDPE	12	210.2	6922.45	6919.40	1.45%	
148A	Connects inlets at south end of parking lot on Tugwell Lane	HDPE	12	22.14	6922.94	6922.45	2.21%	
150	W side of Hickory Ridge, from N side of Louisiana to N side of Mississippi Dr.	HDPE	24	293.84	6919.70	6914.92	1.63%	
150A	W side Hickory Ridge, N side of Louisiana S to MH	HDPE	18	39.24	6919.70	6919.36	0.87%	
151	W side of Hickory Ridge, from MH at Mississippi Dr S to N side of Hickory Ridge	HDPE	24	68.51	6914.92	6914.44	0.70%	
151A	W side of Hickory Ridge, from N of Mississippi Dr. to MH in Mississippi	HDPE	24	279.67	6914.44	6910.71	1.33%	
152	From Hickory Ridge into NW corner of detention pond #32	HDPE	24	45.89	6910.71	6909.01	3.70%	
153	Crosses Hickory Ridge (E-W) at SW corner	HDPE	15	36.29	6910.66	6909.80	2.37%	
153A	Crosses Hickory Ridge (N-S) at SW corner	HDPE	15	29.18	6914.91	6910.71	14.39%	
153B	Connects Inlet 89 to Pond # 32	HDPE	15	38.66	6909.80	6908.85	2.46%	
154	Crosses Hickory Ridge (N-S) at SE corner	HDPE	30	35.96	6921.98	6921.64	0.95%	
155	SE corner of the subdivision from Hickory Ridge into the detention pond #31	HDPE	30	69.41	6921.64	6922.05	-0.59%	
156	SE corner of the subdivision N side of Hickory Ridge	HDPE	30	58.13	6922.39	6921.98	0.71%	
157	W side of Magnolia between Mississippi and Hickory Ridge	HDPE	30	253.95	6924.56	6922.39	0.85%	
158	East end of Mississippi Dr, W of Magnolia Ct	HDPE	30	150.55	6925.94	6924.56	0.92%	
158A	Crosses Mississippi W of Magnolia	HDPE	15	37.28	6925.94	6925.92	0.05%	
159	Crosses Magnolia N of Mississippi	CMP	15	37.01	6928.47	6925.31	8.54%	

Table 2

Existing Storm Drain Pipe Inventory

Pipe No.	Pipe Location	Material Type	Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
160A	Between Manholes W side of Magnolia, between Mississippi and Louisiana	HDPE	24	170.72	6927.22	6925.51	1.00%	
160B	Between Manholes W side of Magnolia, at Mississippi E end	HDPE	24	90.16	6925.51	6925.31	0.22%	
160C	West side of Magnolia at intx w/Mississippi	HDPE	24	70.99	6925.31	6924.56	1.06%	
161	Magnolia Ct at Louisiana, S side	HDPE	24	50.39	6927.66	6927.22	0.87%	
162	Crosses Louisiana Dr. W of Magnolia	HDPE	24	36.18	6931.39	6927.66	10.31%	
163	NW corner of Magnolia and Louisiana, diagonal	HDPE	18	49.71	6933.24	6931.39	3.72%	
164	Crosses Magnolia just N of Louisiana	CMP	15	36.58	6934.11	6933.24	2.38%	
165	N side of Louisiana between Magnolia and Clover	CMP	24	334.73	6934.05	6931.39	0.79%	
166	Crosses Clover at Louisiana	CMP	15	86.64	6936.02	6934.05	2.27%	
167	Crosses Louisiana W of Clover	CMP	15	36.25	6936.34	6936.02	0.88%	
168	Crosses Clover just N of Louisiana	CMP	15	36.54	6935.64	6935.02	1.70%	
169	NE corner of Clover and Louisiana	CMP	24	40.5	6935.02	6934.05	2.40%	Town's notes indicate a 24" coming into 169 from N, no survey record of this line
173	Crosses Hickory Ridge at Louisiana	CMP	15	80.94	6920.17	6919.36	1.00%	
174	Crosses Hickory Ridge N of Louisiana Dr.	CMP	15	36.34	6920.75	6919.70	2.89%	
175	Crosses Mississippi @ Hickory Ridge	CMP	15	36.57	6916.83	6915.39	3.94%	Town note indicate a different pipe configuration
175A	Crosses Hickory Ridge just N of Mississippi	CMP	18	39.05	6916.83	6914.92	4.89%	
176	Crosses Hickory Ridge just S of Mississippi	CMP	18	64.05	6915.39	6914.44	1.48%	Town note indicate a different pipe configuration
205	Inlet to Pond #41, Fox Farm Circle and Jacobs Lane	HDPE	12	23.94	6911.60	6911.29	1.29%	
205B	Fox Farm Circle W of Jacobs Lane	HDPE	12	15.95	6912.78	6912.77	0.06%	
205C	Jacobs Lane N of Fox Farm Circle	HDPE	12	27.71	6912.31	6912.09	0.79%	
205D	NE corner of Fox Farm Circle and Jacobs Lane	HDPE	12	23.03	6912.09	6911.83	1.13%	
205E	Fox Farm Circle E of Jacobs Lane	HDPE	12	27.65	6911.83	6911.60	0.83%	
205F	SW corner of Fox Farm Circle and Jacobs Lane	HDPE	12	16.49	6912.77	6912.65	0.73%	
205G	Jacobs Lane S of Fox Farm Circle	HDPE	12	23.89	6912.65	6912.39	1.09%	
205H	Inlet to Pond #41, Fox Farm Circle and Jacobs Lane	HDPE	12	24.3	6912.39	6911.41	4.03%	
206	Fox Farm Circle, inflow line to Pond # 34	HDPE	18	118.49	6913.09	6910.48	2.20%	
206A	Fox Farm Circle, SE corner	HDPE	12	27.38	6913.30	6913.09	0.77%	
208A	Crosses Fox Farm Circle(Louisiana) W of Mars	CMP	18	48.52	6907.40	6906.64	1.57%	
208B	Connects to Pipe 208A, N side of Fox Farm Circle	CMP	18	14.39	6907.33	6907.20	0.90%	
208C	Connects to Pipe 208A, S side of Fox Farm Circle	CMP	18	11.09	6907.23	6906.64	5.32%	

Table 3
Existing Storm Drain Inlet Inventory

Inlet No.	Inlet Location	No. of Inlets	Size of Each Inlet	Vane Style: Parallel Opening (Neenah Type C)	Vane Style: Perpendicular (Neenah Type A)	Vane Style: Slanted/Angled (Neenah Type R)	Vane Style: Capture Vane (Neenah Type V)	Round/Circular Inlet	Inlet Config: In Sag *	Inlet Config: On Grade *	Grate Surface Elevation	Invert Elevation	Inlet Depth	Comments
1	N side of Taylor Circle, SW corner	3	3' Std CI			X			X		7013.51	7010.21	3.30	
2	S side of Taylor Circle, SW corner	3	3' Std CI			X			X		7013.62	7009.67	3.95	
3	W side of stub street N side of Dove Ranch Rd, W of Mountain View	1	3' Std CI			X				X	7058.85	7056.09	2.76	
4	E side of stub street N side of Dove Ranch Rd, W of Mountain View	1	3' Std CI			X				X	7059.09	7056.14	2.95	
5	NW corner of intersection of Mountain View and Dove Ranch Rd	2	3' Std CI			X				X	7065.62	7059.87	5.75	
6	S of stub street rear lot line, S side of Dove Ranch Rd	1	2' Diameter	X				X		X	7057.85	7043.90	13.95	Surface Inlet/Flat Grate behind curb
7	SW corner of intersection of Mountain View and Dove Ranch Rd	2	3' Std CI			X				X	7066.76	7059.47	7.29	
8	NW corner of intersection of Cactus Dr and Dove Ranch Rd	2	3' Std CI			X				X	7129.21	7125.75	3.46	
9	SW corner of intersection of Cactus Dr and Dove Ranch Rd	2	3' Std CI			X				X	7130.05	7125.31	4.74	
10	E side of Cactus Dr, rear lot line of Dove Ranch Rd homes	1	2' Diameter	X				X	X		7132.04	7126.62	5.42	Connected to 36" HDPE
11	Inside radius of Palo Verde Dr, just N of N Oak Dr.	1	2' x 3'	X					X		7100.38	7097.78	2.60	Surface Inlet/Flat Grate
12	SW corner of intersection of Sossmon/E Oak Dr and Mountain View	1	2' x 3'							X	7053.16	7047.46	5.70	Surface Inlet/Flat Grate behind curb
13	E most inlet W of Mountain View on Sossamon	1	3'x2' CI	X					X		7051.06	7048.46	2.60	Wide Gutter Pan on Inlet
14	W most inlet W of Mountain View on Sossamon	1	3'x2' CI	X					X		7052.74	7046.92	5.82	Wide Gutter Pan on Inlet
15	NW corner of intersection E Lakeside Dr and Mountain View	1	3' Std CI	X					X		7014.22	7011.74	2.48	Debris Screen, Surface Inlet/Flat Grate
15A	Intersection of BayfieldPkwy and Kremer Dr, S side of street	1	3' Std CI						X		7011.50	7005.57	5.93	
16	SE corner of intersection of E Lakeside Dr and Westview Dr.	1	18" x 30"	X					X		7010.41	7008.41	2.00	Debris Screen, Surface Inlet/Flat Grate
16A	SW corner of Cinnamon Dr	1	3' Std CI						X		7009.25	7003.60	5.65	
17	W-NW side of traffic Circle	1	3'x2' CI	X					X		6955.68	6950.16	5.52	
17A	NE side of the traffic circle, behind curb	1	3'x2'	X					X		6954.12	6949.65	4.47	Surface Inlet/Flat Grate
17B	NE corner of the traffic circle	1	3'x2' CI	X					X		6955.62	6948.08	7.54	
18A	SW Corner of Cinnamon Dr.	1	3'x2' CI	X						X	7018.00	7013.00	5.00	
18	South of traffic circle, E of CR 502	1	3'x2' CI	X					X		6952.90	6947.12	5.78	
19	N of CDOT 160 and CR 501 intersection, E side of CR 501	1	3' x3'	X					X		6923.19	6919.71	3.48	Surface Inlet/Flat Grate
20	NE corner of CDOT 160 and CR 501 intersection, E side of CR 502	1	3.5' x5.5'	X					X		6929.68	6918.33	11.35	Surface Inlet/Flat Grate
21	NE corner of CDOT 160 and CR 501 intersection	1	3'X3'	X						X	6928.11	6922.81	5.30	Surface Inlet/Flat Grate
22	N side of the W drive to the convenience store	1	3' x 3.5'	X					X		6925.40	6923.80	1.60	Surface Inlet/Flat Grate
23	W side of the convenience store parking lot/drive way	1	24"	X				X		X	6925.11	6910.11	15.00	Surface Inlet/Flat Grate
24	W side of Convenience store driveway/parking lot	1	3'X3'	X					X		6925.62	6923.29	2.33	
25	N side of the W drive to the convenience store	1	3' x 3.5'	X					X		6921.16	6919.08	2.08	Surface Inlet/Flat Grate
26	SE corner of Bayfield Parkway and CR 521, curb side	1	3' x 3'	X						X	6909.58	6903.33	6.25	Surface Inlet/Flat Grate
27	NE corner of intersection of Bayfield Parkway and CR 501	1	3'X3'	X					X		6919.82	6917.92	1.90	
28	SE corner of Bayfield Parkway and CR 521, behind curb	1	2' Diameter	X				X	X		6907.80	6905.55	2.25	Surface Inlet/Flat Grate BoC
29	E side of Buck Hwy, behind curb, just S of Pearl St and Buck Hwy intersection	1	2' Diameter	X				X	X		6904.02	6902.07	1.95	Surface Inlet/Flat Grate BoC
30	E side of Buck Hwy, behind curb, between Pearl Street and W Park St intersections w/Buck Hwy intersection	1	2' Diameter	X				X	X		6902.89	6900.82	2.07	Surface Inlet/Flat Grate BoC
31	E side of Buck Hwy, behind curb, between Church St and W Park St intersections w/Buck Hwy intersection	1	2' Diameter	X				X	X		6901.37	6898.47	2.90	Surface Inlet/Flat Grate BoC
32	E side of Buck Hwy, behind curb, @ Church St & Buck Hwy intersection	1	2' Diameter	X				X	X		6899.10	6897.18	1.92	Surface Inlet/Flat Grate BoC
33	E side of Buck Hwy, behind curb, @ S of Church St & Buck Hwy intersection	1	2' Diameter	X				X	X		6897.18	6895.48	1.70	Surface Inlet/Flat Grate BoC
34	E side of Buck Hwy, behind curb, @ between Church St & Mill St intersections w/Buck Hwy	1	2' Diameter	X				X	X		6895.40	6892.34	3.06	Surface Inlet/Flat Grate BoC
35	E side of Buck Hwy, just N of Church St and Buck Hwy intersection	1	3' Std CI				X			X	6901.42	6897.56	3.86	
36	W side of Buck Hwy, just N of Church St and Buck Hwy intersection	1	3' Std CI				X			X	6901.06	6897.40	3.66	

Table 3
Existing Storm Drain Inlet Inventory

Inlet No.	Inlet Location	No. of Inlets	Size of Each Inlet	Vane Style: Parallel Opening (Neenah Type C)	Vane Style: Perpendicular (Neenah Type A)	Vane Style: Slanted/Angled (Neenah Type R)	Vane Style: Capture Vane (Neenah Type V)	Round/Circular Inlet	Inlet Config: In Sag *	Inlet Config: On Grade *	Grate Surface Elevation	Invert Elevation	Inlet Depth	Comments
37	NW corner of intersection Bayfield Center Dr and Mountain View Dr, behind curb	1	2' Diameter	X				X	X		6971.47	6969.00	2.47	Debris Screen, Surface Inlet/Flat Grate BoC
38	N side of Bayfield Center Dr, half way between Commerce Dr and Mountain View Dr., behind curb	1	2' x 3'	X						X	6971.78	6969.40	2.38	Surface Inlet/Flat Grate BoC
39	SW corner of intersection Bayfield Center Dr and Mountain View Dr	1	3' Std CI	X					X		6970.96	6968.57	2.39	
40	N side of Colorado Dr. half way between Mountain View and Commerce Dr.	1	18" x 3'	X					X		6964.36	6962.16	2.20	Surface Inlet/Flat Grate
41	W side of Joint Maintenance Facility, N of Pond #28	1	2' X 3'	X						X	6974.28	6970.88	3.40	Surface Inlet/Flat Grate
42	W side of Joint Maintenance Facility, immediately N of Pond #25	1	2' X 3'	X						X	6971.18	6966.18	5.00	Surface Inlet/Flat Grate
45	W side of subdivision, N side of Kremer Dr	1	3' Std CI				X			X	7013.82	7011.02	2.80	
46	NW corner of Cinnamon Dr and Kremer Dr.intersection	1	3' Std CI				X		X		7017.21	7012.53	4.68	
47	SW corner of Cinnamon Dr and Kremer Dr. intersection	1	3' Std CI				X			X	7018.12	7013.15	4.97	
48	E side of Cinnamon Dr, S of Kremer Dr	1	3' Std CI				X			X	7018.66	7016.40	2.26	
49	W side of Kremer Dr(N-S section E side of subdivision), just S of Moon Circle	1	3' Std CI		X				X		6995.11	6993.04	2.07	
50	N side of South St, W of E East St	1	18" X24"	X						X	6878.20	6875.16	3.04	Surface Inlet/Flat Grate in Gutter
51	E side of Kremer Dr(N-S section E side of subdivision), just S of Moon Circle	1	3' Std CI		X				X		6995.04	6992.70	2.34	
52	S side of South St, W of E East St	1	3' Std CI				X		X		6878.20	6875.63	2.57	
53	N side of intersection w/Full Moon Circle and Kremer Dr.	1	3' Std CI				X		X		6992.83	6990.88	1.95	
54	SE side of cul-de-sac in Full Moon Circle	1	3' Std CI				X		X		6991.55	6988.96	2.59	
55	W side of Hickory Ridge, N of Mississippi	1	3' Std CI				X		X		6921.87	6914.92	6.95	
56	S side of Mill St just E of Bayfield Parkway @ the bend in St	1	18" CI				X		X		6875.97	6873.64	2.33	
57	N side of Mill St just E of Bayfield Parkway @ the bend in St	1	18" CI				X		X		6877.04	6874.89	2.15	
58	SE corner of JMF yard, immediately S of Pond #25	1	2' X 3'	X					X		6970.14	6966.99	3.15	Surface Inlet/Flat Grate
60	E side of Buck Hwy, N of Mill St and Buck hwy intersection	1	2' Diameter	X				X	X		6892.95	6890.63	2.32	Surface Inlet/Flat Grate BoC
61	W side of Buck Hwy, just N of Mill St and Buck Hwy intersection	1	3' Std CI				X			X	6893.00	6890.40	2.60	
62	N side of Mill St @ intersection of E East St and Mill St	1	18" CI				X		X		6885.47	6882.27	3.20	
63	E side of Buck Hwy, just N of Mill St and Buck Hwy intersection	1	3' Std CI				X			X	6893.28	6890.58	2.70	
64	SW corner of intersection of Mesa Dr and Fox Farm Circle	2	3' Std CI						X		6924.53	6922.18	2.35	West side of Street
65	E side of Buck Hwy , just S of Mill St and Buck Hwy intersection	1	3' Std CI				X		X		6896.32	6894.32	2.00	
66	E side of Buck Hwy , just N of South St and Buck Hwy intersection	1	3' Std CI				X		X		6892.87	6890.80	2.07	
67	S side of Mill St @ intersection of E East St and Mill St	1	3' Std CI				X			X	6884.60	6879.27	5.33	
68	S side of Mill St between Church and Pearl Sts	1	3' Std CI				X			X	6883.93	6877.93	6.00	
69	W side of Buck Hwy, N of South St and Buck Hwy intersection	1	3' Std CI				X			X	6893.33	6886.73	6.60	
70	S side of South St, W of Church St	1	18" X24"	X					X		6876.95	6874.95	2.00	Surface Inlet/Flat Grate in Gutter
71	N side of South St, W of Church St	1	3' Std CI				X			X	6876.52	6874.89	1.63	
72	E side of Buck Hwy, N of South St and Buck Hwy intersection	1	3' Std CI				X			X	6893.19	6887.19	6.00	
73	Fox Farm Circle and parking lot access drive to southern apt., all corner/all sides	1	3' Std CI				X		X		6914.61	6912.31	2.30	
74	E side of Fox Farm Circle , inlet to Pond # 33	1	3' Std CI				X		X		6915.40	6913.30	2.10	
75	Fox Farm Circle and parking lot access drive to southern apt., all corner/all sides	1	3' Std CI				X			X	6915.61	6912.71	2.90	
76	W side of Fox Farm Circle , inlet to Pond # 33	2	3' Std CI				X			X	6915.49	6913.09	2.40	
77	Fox Farm Circle and parking lot access drive to southern apt., all corner/all sides	1	3' Std CI				X		X		6915.67	6912.77	2.90	
78	Fox Farm Circle and parking lot access drive to southern apt., all corner/all sides	1	3' Std CI				X		X		6914.65	6912.65	2.00	
79	Fox Farm Circle and parking lot access drive to southern apt., all corner/all sides	1	3' Std CI				X		X		6914.54	6912.09	2.45	
80	W side of Hickory Ridge, N of Louisiana	1	3' Std CI	X					X		6924.30	6919.70	4.60	
81	NW corner of intersection of Louisiana and Mars Dr	1	3' Std CI				X		X		6909.78	6907.33	2.45	

Table 3
Existing Storm Drain Inlet Inventory

Inlet No.	Inlet Location	No. of Inlets	Size of Each Inlet	Vane Style: Parallel Opening (Neenah Type C)	Vane Style: Perpendicular (Neenah Type A)	Vane Style: Slanted/Angled (Neenah Type R)	Vane Style: Capture Vane (Neenah Type V)	Round/Circular Inlet	Inlet Config: In Sag *	Inlet Config: On Grade *	Grate Surface Elevation	Invert Elevation	Inlet Depth	Comments
82	Fox Farm Circle and parking lot access drive to southern apt., all corner/all sides	1	3' Std CI				X		X		6913.58	6911.83	1.75	
83	SW corner of intersection of Louisiana and Mars Dr	1	3' Std CI				X		X		6909.83	6907.23	2.60	
84	Fox Farm Circle and parking lot access drive to southern apt., all corner/all sides	1	3' Std CI				X		X		6913.35	6911.60	1.75	
85	Fox Farm Circle and parking lot access drive to southern apt., all corner/all sides	1	3' Std CI				X			X	6914.54	6912.39	2.15	
86	W side of Hickory Ridge, in the SW corner of the subdivision, just N of pond # 32	1	3' Std CI				X		X		6917.46	6910.71	6.75	
87	E side of Hickory Ridge, in the SW corner of the subdivision, just N of pond # 32	1	3' Std CI				X		X		6917.63	6914.91	2.72	
88	N side of Hickory Ridge, in the SW corner of the subdivision, just N of pond # 32	1	3' Std CI				X		X		6916.59	6910.66	5.93	
89	S side of Hickory Ridge, in the SW corner of the subdivision, just N of pond # 32	1	3' Std CI				X		X		6916.50	6909.80	6.70	
90	NE corner of intersection of Mississippi & Hickory Ridge, on Mississippi	1	3' Std CI				X		X		6921.83	6916.83	5.00	
91	SE corner of intersection of Mississippi & Hickory Ridge, on Mississippi	1	3' Std CI				X		X		6921.89	6915.39	6.50	
92	E side of Hickory Ridge, N of Mississippi	1	3' Std CI				X		X		6921.78	6916.83	4.95	
93	E side of Hickory Ridge, N of Louisiana	1	3' Std CI	X					X		6924.20	6920.75	3.45	
94	NE corner of Louisiana & Hickory Ridge on Louisiana	1	3' Std CI	X					X		6924.17	6920.17	4.00	
95	W side of Clover Dr, just N of Louisiana Dr.	1	3' Std CI	X						X	6939.14	6935.64	3.50	
96	N side of Louisiana Dr, just W of Clover Dr.	1	3' Std CI	X						X	6939.16	6936.02	3.14	
96A	S side of Louisiana Dr, just W of Clover Dr.	1	3' Std CI	X						X	6939.08	6936.34	2.74	
97	E side of Clover Dr, just N of Louisiana Dr.	1	3' Std CI	X						X	6939.12	6935.02	4.10	
98	W side of Magnolia Ct, N of Louisiana Dr	1	3' Std CI	X					X		6935.72	6933.24	2.48	
99	N side of Louisiana Dr, W of Magnolia Ct	1	3' Std CI	X					X		6935.69	6931.39	4.30	
100	E side of Magnolia Ct, N of Louisiana Dr	1	3' Std CI	X					X		6936.14	6934.11	2.03	
101	E side of Magnolia Ct, N of Mississippi Dr	1	3' Std CI	X					X		6934.00	6928.47	5.53	
102	S side of Louisiana Dr, W of Magnolia Ct	1	3' Std CI	X					X		6935.61	6927.66	7.95	
103	W side of Magnolia Ct, N of Mississippi Dr	1	3' Std CI	X					X		6933.84	6925.31	8.53	
104	N side of Mississippi Dr, W of Magnolia Ct	1	3' Std CI		X					X	6931.18	6925.94	5.24	
105	S side of Mississippi Dr, W of Magnolia Ct	1	3' Std CI		X					X	6931.12	6925.92	5.20	
106	W side of Magnolia Ct, N of Hickory Ridge	1	3' Std CI		X				X		6930.94	6922.39	8.55	
107	N side of Hickory Ridge, W of Magnolia Ct	1	3' Std CI		X				X		6930.41	6921.98	8.43	
108	S side of Hickory Ridge, W of Magnolia Ct	1	3' Std CI		X				X		6930.54	6921.64	8.90	
110	N side of Day Lily, E of Clover	1	3' Std CI	X					X		6951.02	6948.32	2.70	
111	S side of Day Lily, E of Clover	2	3' Std CI	X					X		6950.82	6948.32	2.50	
112	NE corner of intersection of Commerce and Colorado	1	3' Std CI	X						X	6964.36	6962.40	1.96	
113	Rear lot line Dove Ranch, E of Taylor Circle	1	2' Diameter	X				X	X		7043.29	7033.29	10.00	Surface Inlet/Flat Grate
114	Fox Farm N side of walking trail. S of the N buildings	1	3' Std CI		X				X		6925.04	6922.94	2.10	
115	Fox Farm S side of walking trail. S of the N buildings	1	3' Std CI		X				X		6925.00	6922.45	2.55	
117	E of Buck Hwy. NW of Mars	1	3' Std CI		X					X	6898.79	6896.26	2.53	
118	SW Corner of the WTP	1	2' Diameter	X				X	X		6999.33	6997.33	2.00	Debris Screen, Surface Inlet/Flat Grate
119	W side of Mountain View, N of irrigation ditch, S of Sossamon	1	2' Diameter	X				X	X		7040.87	7031.80	9.07	Surface Inlet/Flat Grate
120	SE corner of intersection of Mesa Dr and Fox Farm Circle	1	3' Std CI					X		X	6924.15	6921.65	2.50	East side of Street
121	E side of Mountain View, S of Dove Ranch Rd@rear lot line	1	2' Diameter	X				X	X		7066.00	7056.62	9.38	East side of Street

* The term "IN SAG" indicates that the inlet is in a low topographical point relative to the surrounding area
** The term "ON GRADE" indicates that the grate is on a continous grade

Table 4
Existing Stormwater Pond Inventory

Pond #	Runoff Source	Outlet Structure	Pond Bottom Elevation (ft)	Overflow Elevation (ft)	Estimated Pond Volume (Ac-Ft)	Outlet Pipe Number	Comments
1	Dove Ranch Subdivision to north and east	8"PVC pipe	7008.00	7010.00	0.207	185	Discharge pipe near top of berm; intended to be sedimentation pond, only
2	Bayfield High School building and parking lots	4' dia vert pipe w/4" holes at about 6" center w/screen on top, connected to outlet drainage w/24" CMP pipe, discharge from pond into a drainage channel,	6972.00	6974.00	0.678	184	Water from CR and Pond #2 discharges into a drainage "pond" that then drains thru a 24" CMP under CR to River, this area also collects school water and discharges all water under CR to river
3	Bayfield HS athletic facilities	4' dia vert pipe w/4" holes at about 6" center w/screen on top, drainage discharged thru 12" HDPE	6966.10	6967.50	0.246	116	Discharge into drainage channel thru Bayfield Center
5	Adjacent storage units	Concrete overflow weir	6963.08	6965.12	0.054	N/A	No outlet pipe visible
6	UPRFPD Administration Building	8"PVC, pipe capped w/3" hole in the end	6961.65	6962.78	0.040	187	
7	Adjacent office building	8"PVC, pipe capped w/3" hole in the end	6964.58	6965.82	0.008	188	
8	Adjacent office building parking lot	8"PVC, 8" tee, open top pipe, end capped w/3" hole in end	6963.63	6965.09	0.007	189	
9	Adjacent storage units	None visible	6963.7	6965.51	0.100	N/A	
10	Adjacent carwash	Known outlet pipes appear to be covered with silt	6970.66	6971.08	0.023	N/A	Pond is silted nearly full; outlet pipes not visible. Modeled without outlet pipe.
11	Adjacent office building and parking lot	6"X6" opening on side of concrete box, open top 16" X 18", 12" PVC discharge pipe	6958.82	6960.92	0.044	108	
12	Adjacent body shop and parking lot	Known outlet pipe not visible (submerged by high ground water or silt/vegetation)	6960.7	6963.75	0.101	N/A	Modeled without outlet pipe
13	Pine River Valley Bank facilities	Two 6"PVC pipes	6955.91	6956.81	0.067	190	
14	Dollar General store	8" PVC pipe	6955.79	6956.26	0.025	192	
15	Bayfield Library	3' X 5' concrete box w/6" square opening on the side, three 6" PVC discharge pipes	6973.84	6975.65	0.080	193	
16	Bayfield Library parking lot and overflow from Pond #15	4' X 4' outlet box w/3" diameter opening on the side, two 6" PVC discharge pipes	6973.5	6974.69	0.015	194	
17	Baptist Church facilities	8" PVC pipe	6929.88	6931.06	0.020	198	
18	Sunrise Estates Subdivision	12" CMP pipe	6990.3	6992.91	0.203	99	
19	Adjacent convenience store and car wash, adjacent streets, Hwy 160, Ponds #20 and #21	20" X 30" concrete box, 8" diameter opening on side, 18" CMP discharge pipe	7000.36	7009.16	3.729	120	
20	Cinnamon Heights townhomes	6" PVC pipe	7009.14	7014.02	0.161	196	
21	Cinnamon Drive and adjacent properties	None visible	7011.97	7016.17	0.092	N/A	Pond design and function is not clear; appears to have irrigation component. Modeled without outlet pipe.
22	Street and adjacent properties	6"PVC pipe	7011.29	7014.84	0.089	197	
23	Sunrise Estates Subdivision	12" CMP pipe	6981.18	6988.85	0.761	195	
24	Adjacent property to east	2'8" X 2'8" concrete box w/two 12" diameter openings on side, open top, 15" CMP discharge pipe	6989.64	6992.53	0.582	91	Low point on berm allows overtopping before reaching top of concrete box; berm needs to be leveled
25	Joint Maintenance Facility	12" CMP pipe	6964.76	6969.74	0.403	87	
26	Adjacent building and property	None visible	6963.49	6964.76	0.020	N/A	
27	Adjacent building and property	None visible	6959.59	6961.36	0.045	N/A	

Table 4

Existing Stormwater Pond Inventory

Pond #	Runoff Source	Outlet Structure	Pond Bottom Elevation (ft)	Overflow Elevation (ft)	Estimated Pond Volume (Ac-Ft)	Outlet Pipe Number	Comments
28	Adjacent building and property	2" Pump Line	6955.33	6958.10	0.055	N/A	Appears to have irrigation function, modeled without piped discharge
29	Clover Meadows Subdivision	None visible	6928.58	6929.49	0.131	N/A	
30	Clover Meadows Subdivision	18" CMP w/cap w/5" diameter hole	6942.3	6946.42	3.662	171	
31	Mesa Meadows Subdivision	2-12" diameter PVC	6919.99	6928.34	2.224	203 & 204	
32	Mesa Meadows Subdivision	2-6" PVC to S 2-12" PVC to S 1-10" PVC to W	6908.76	6914.23	1.381	179, 180, 181, 182, & 183	
33	Fox Farm Village Subdivision	12"PVC w/Tee, open top, end cap on tee w/2"dia hole for inlet	6912.59	6914.18	0.045	200	
34	Fox Farm Village Subdivision	12"PVC w/Tee, open top, end cap on tee branch w/4-3/4" holes in cap, and 2"dia hole for inlet	6907.06	6911.32	0.204	201	
35	Bayfield Early Education Preschool	6" PVC to the SW	6924.17	6925.15	0.117	199	
36	Fox Farm Village Subdivision	Riprap weir	6916.89	6920.08	0.110	N/A	
37	Bayfield Town Hall	3' X3' concrete box w/4" hole in the side, open top, 18" HDPE discharge pipe	6874.3	6875.52	0.088	219	
38	Bayfield Senior Center	12" HDPE	6857.42	6858.48	0.367	220	
40	Adjacent building and property	2-4" PVC near top of berm	6966.21	6967.76	0.006	191	
41	Fox Farm Village Subdivision	12"PVC w/Tee, open top, end cap on tee w/2"dia hole for inlet	6910.20	6914.00	0.140	207	

Table 5
Existing Stormwater Pond Outlet Pipe Inventory

Pipe No.	Pond No.	Pipe Material	Outlet Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
87	25	CMP	12	22.86	6966.11	6964.53	6.91%	
91	24	CMP	15	17	6990.22	6990	1.29%	
99	18	CMP	12	19	6992.36	6991.61	3.95%	
108	11	PVC	12	19.5	6958.82	6958.40	2.15%	
116	3	HDPE	12	45	6966.08	6965.11	2.16%	
120	19	CMP	18	89.87	7000.36	6995.47	5.44%	
171	30	CMP	18	48	6941.89	6941.48	0.85%	
179	32	PVC	10	128	6909.58	6909.04	0.42%	
180		PVC	12	27	6911.16	6909.56	5.93%	
181		PVC	6	31	6909.54	6908.26	4.13%	
182		PVC	6	33	6909.66	6907.58	6.30%	
183		PVC	12	28	6911.09	6909.62	5.25%	
184	2	PVC	12	40	6974.7	6971.09	9.02%	
185	1	PVC	8	52	7009.13	7008.42	1.37%	
187	6	PVC	8	40	6961.55	6960.00	3.88%	Pipe information estimated
188	7	PVC	8	80	6964.58	6963.00	1.97%	Pipe information estimated
189	8	PVC	8	80	6963.63	6962.00	2.04%	Pipe information estimated
190	13	PVC	6"	20	6955.57	6954.96	3.05%	
190-A		PVC	6"	19	6955.25	6955.17	0.42%	
191-A	40	PVC	4	10	6967.04	6966.28	7.60%	
191-B		PVC	4	10	6967.44	6966.68	7.60%	
192	14	PVC	8	14	6955.92	6955.60	2.29%	
193	15	PVC	Three - 6"	100	6973.95	6973.90	0.05%	Downstream invert estimated
194	16	PVC	Two - 6"	23	6973.45	6969.46	17.35%	Downstream invert estimated
195	23	CMP	12	139	6981.00	6975.00	4.32%	Pipe information estimated
196	20	PVC	6	60	7009.50	7009.45	0.08%	
197	22	PVC	6	30	7011.46	7010.96	1.67%	
198	17	PVC	8	13	6929.88	6929.59	2.23%	
199	35	PVC	6	32	6924.17	6923.1	3.34%	Inverts estimated
200	33	PVC	12	15	6912.64	6911.94	4.67%	
201	34	PVC	12	48	6907.84	6907.45	0.81%	
203	31	PVC	12	13.3	6925.56	6925.34	1.65%	
204		PVC	12	13.3	6925.55	6925.31	1.80%	
207	41	PVC	12	18	6912.22	6910.58	9.11%	
219	37	HDPE	18	94	6874.08	6873.56	0.55%	
220	38	HDPE	12	30	6857.00	6856.00	3.33%	

Table 6
Basin Characteristics and Estimated Flows

Basin ID	Area (acres)	Weighted Curve Number	Average Slope (%)	Equivalent Width (ft)	Impervious Area (%)	5-Year Storm Peak Runoff (cfs)	5-Year Storm Time Of Concentration (D H:M:S)	100-Year Storm Peak Runoff (cfs)	100-Year Storm Time Of Concentration (D H:M:S)
1	6.40	87.00	2.2600	652.00	37.00	7.28	0 00:59:28	16.48	0 00:48:31
10	2.69	87.00	1.0700	537.00	50.00	4.04	0 00:43:19	8.38	0 00:35:20
11	2.65	87.00	1.1900	340.00	85.00	5.31	0 00:26:31	9.68	0 00:21:38
12	3.37	87.00	1.0900	493.00	85.00	6.87	0 00:25:11	12.45	0 00:20:33
12A	1.42	87.00	0.5000	217.00	37.00	1.50	0 01:13:26	3.36	0 00:59:55
13	4.57	87.00	1.2900	726.00	85.00	9.59	0 00:22:48	17.22	0 00:18:36
15	8.22	87.00	0.5000	500.00	25.00	5.17	0 02:21:32	11.81	0 01:55:28
17	1.51	87.00	1.5600	1399.47	85.00	3.57	0 00:07:28	6.07	0 00:06:06
19	1.08	87.00	5.7200	260.00	80.00	2.44	0 00:13:28	4.24	0 00:10:59
20	2.00	87.00	10.0000	339.00	37.00	3.01	0 00:28:03	6.41	0 00:22:53
20A	0.81	87.00	15.0000	232.00	37.00	1.39	0 00:18:05	2.76	0 00:14:45
20B	1.49	87.00	14.0000	220.00	37.00	2.25	0 00:27:31	4.78	0 00:22:27
20C	0.93	87.00	14.0000	172.00	37.00	1.47	0 00:24:01	3.05	0 00:19:36
20D	0.94	87.00	14.6000	165.00	37.00	1.49	0 00:24:33	3.09	0 00:20:02
20E	0.73	87.00	15.0000	135.00	37.00	1.16	0 00:23:29	2.40	0 00:19:09
20F	0.96	87.00	11.8000	208.00	37.00	1.54	0 00:23:00	3.17	0 00:18:45
20G	0.64	87.00	10.9000	296.00	37.00	1.15	0 00:15:01	2.23	0 00:12:15
20H	0.92	87.00	10.6000	275.00	37.00	1.56	0 00:19:40	3.13	0 00:16:03
20I	0.50	87.00	12.7000	148.00	37.00	0.86	0 00:18:44	1.71	0 00:15:17
20J	0.13	87.00	0.5000	283.00	90.00	0.32	0 00:05:58	0.54	0 00:04:52
20K	0.12	87.00	0.5000	565.23	90.00	0.29	0 00:03:42	0.49	0 00:03:01
21	29.02	84.00	6.6000	2500.00	37.00	32.54	0 00:47:42	76.28	0 00:38:55
23	7.66	87.00	0.7100	840.00	37.00	7.77	0 01:20:34	17.37	0 01:05:44
24	25.06	87.00	1.4500	2412.00	85.00	48.28	0 00:29:43	89.12	0 00:24:15
25	13.52	87.00	1.6600	512.84	85.00	21.03	0 00:49:54	39.35	0 00:40:43
26	0.87	87.00	0.6400	331.00	85.00	1.95	0 00:16:41	3.42	0 00:13:37
27	1.23	87.00	0.4700	426.00	85.00	2.67	0 00:19:17	4.72	0 00:15:44
28	1.53	87.00	0.9100	548.00	85.00	3.46	0 00:15:32	6.03	0 00:12:41
30	3.17	95.00	0.8900	562.00	85.00	6.94	0 00:23:50	12.19	0 00:19:27
31	0.94	95.00	1.0400	304.00	85.00	2.22	0 00:15:52	3.80	0 00:12:56
32	0.94	95.00	0.5100	205.00	85.00	2.04	0 00:24:55	3.59	0 00:20:20
33	22.41	95.00	0.7300	948.00	37.00	22.15	0 02:21:30	44.94	0 01:55:27
34	1.36	95.00	0.1400	360.00	85.00	2.69	0 00:32:42	4.87	0 00:26:41
35	1.57	87.00	0.2300	852.00	85.00	3.46	0 00:18:17	6.09	0 00:14:55
36	0.97	95.00	0.7300	294.00	80.00	2.21	0 00:21:47	3.84	0 00:17:46
37	0.84	87.00	0.2300	861.00	50.00	1.47	0 00:25:45	2.90	0 00:21:00
38	1.77	95.00	0.1400	379.00	37.00	2.23	0 01:27:44	4.51	0 01:11:35
39	7.73	87.00	0.6800	2116.57	37.00	9.59	0 00:47:08	21.64	0 00:38:27
39A	0.55	95.00	0.5000	399.00	37.00	1.10	0 00:28:42	2.01	0 00:23:25
47	0.28	95.00	0.4600	178.00	70.00	0.65	0 00:20:35	1.13	0 00:16:48
52	0.92	87.00	0.4600	258.00	37.00	1.09	0 00:52:04	2.48	0 00:42:29
53	2.74	87.00	4.7100	411.00	37.00	3.70	0 00:37:52	8.20	0 00:30:54
55	11.46	82.00	1.5400	600.00	37.00	9.93	0 01:39:30	21.46	0 01:21:10
56	0.93	87.00	0.1100	192.00	37.00	0.88	0 01:36:19	1.93	0 01:18:35
57	15.46	87.00	5.0300	861.00	37.00	16.80	0 01:07:14	37.91	0 00:54:51
58	6.97	87.00	4.5800	961.00	37.00	9.19	0 00:40:08	20.49	0 00:32:44
59	11.10	87.00	1.6900	543.00	37.00	10.28	0 01:40:49	22.63	0 01:22:15
60	8.17	87.00	1.6700	700.00	37.00	8.64	0 01:12:16	19.43	0 00:58:57
61	2.58	82.00	3.1200	775.00	20.00	2.32	0 00:32:35	6.38	0 00:26:35
62	5.43	87.00	2.0000	2414.77	50.00	9.80	0 00:22:11	19.01	0 00:18:05
63	4.67	87.00	3.0400	1280.00	37.00	6.86	0 00:30:03	14.76	0 00:24:31
64	3.10	87.00	4.2900	900.00	37.00	4.79	0 00:26:12	10.08	0 00:21:22
65	9.07	87.00	3.0600	2569.72	37.00	13.43	0 00:29:24	28.79	0 00:23:59
66	0.84	87.00	1.3700	749.90	37.00	1.44	0 00:18:50	2.87	0 00:15:22
67	6.51	87.00	0.5000	500.00	25.00	4.34	0 02:03:05	10.13	0 01:40:25
68	1.35	75.00	0.6200	609.40	37.00	1.30	0 00:35:56	3.26	0 00:29:19
69	5.94	65.00	0.4500	1681.85	37.00	5.38	0 00:52:17	10.71	0 00:42:39
71	1.77	87.00	1.9700	370.00	50.00	2.84	0 00:35:05	5.79	0 00:28:38

Table 6
Basin Characteristics and Estimated Flows

Basin ID	Area (acres)	Weighted Curve Number	Average Slope (%)	Equivalent Width (ft)	Impervious Area (%)	5-Year Storm Peak Runoff (cfs)	5-Year Storm Time Of Concentration (D H:M:S)	100-Year Storm Peak Runoff (cfs)	100-Year Storm Time Of Concentration (D H:M:S)
72	7.00	87.00	0.8100	988.00	37.00	7.64	0 01:06:34	17.24	0 00:54:18
73	6.64	87.00	0.9700	552.00	37.00	6.55	0 01:26:39	14.57	0 01:10:41
74	1.78	87.00	0.2000	266.00	37.00	1.67	0 01:37:43	3.68	0 01:19:43
74A	0.10	87.00	0.5000	308.23	37.00	0.19	0 00:12:06	0.35	0 00:09:53
74B	0.24	87.00	0.5000	290.57	37.00	0.39	0 00:21:04	0.80	0 00:17:11
74C	0.55	87.00	0.5000	392.00	70.00	1.15	0 00:18:35	2.07	0 00:15:10
74D	1.18	87.00	0.5000	300.00	37.00	1.39	0 00:53:59	3.15	0 00:44:02
74E	1.84	87.00	0.5000	300.00	37.00	2.80	0 01:10:33	6.50	0 00:57:34
74F	1.00	87.00	0.5000	587.00	40.00	1.48	0 00:31:40	3.16	0 00:25:50
74G	1.22	87.00	0.5000	374.08	40.00	1.58	0 00:46:51	3.49	0 00:38:14
74H	1.67	87.00	0.5000	384.64	37.00	1.93	0 00:57:22	4.36	0 00:46:48
75	3.53	87.00	0.9300	503.00	37.00	3.92	0 01:03:31	8.87	0 00:51:49
75A	1.18	87.00	0.5000	405.00	37.00	1.48	0 00:45:02	3.34	0 00:36:44
75B	0.19	87.00	0.5000	105.03	37.00	0.26	0 00:33:38	0.58	0 00:27:26
75C	2.55	87.00	0.5000	436.00	40.00	2.91	0 01:06:33	6.44	0 00:54:18
76	1.95	87.00	2.0900	298.00	37.00	2.41	0 00:47:45	5.44	0 00:38:57
76A	1.00	87.00	0.5000	300.00	37.00	1.22	0 00:48:53	2.76	0 00:39:53
76B	0.70	87.00	0.5000	176.88	50.00	1.02	0 00:47:01	2.12	0 00:38:21
76C	0.85	87.00	0.5000	719.79	37.00	1.31	0 00:26:16	2.76	0 00:21:25
76D	1.19	87.00	0.5000	270.36	37.00	1.37	0 00:57:48	3.10	0 00:47:09
76E	0.97	87.00	0.5000	205.99	37.00	1.10	0 01:00:22	2.50	0 00:49:15
77	1.23	87.00	1.0700	358.00	37.00	1.63	0 00:39:36	3.62	0 00:32:18
77A	0.21	87.00	0.5000	182.00	70.00	0.45	0 00:16:41	0.81	0 00:13:36
77B	2.25	87.00	0.5000	612.53	37.00	2.69	0 00:51:52	6.10	0 00:42:19
78	2.77	87.00	1.1900	773.00	37.00	3.68	0 00:39:24	8.19	0 00:32:08
78A	0.58	87.00	0.5000	318.49	40.00	0.86	0 00:33:12	1.83	0 00:27:05
78B	1.97	87.00	0.5000	488.74	40.00	2.44	0 00:53:16	5.41	0 00:43:27
78C	1.41	87.00	0.5000	653.00	40.00	1.99	0 00:36:34	4.32	0 00:29:50
78D	0.71	87.00	0.5000	656.58	37.00	1.12	0 00:24:56	2.33	0 00:20:21
78E	0.37	87.00	0.5000	100.00	50.00	0.54	0 00:45:11	1.13	0 00:36:52
78F	0.31	87.00	0.5000	82.90	50.00	0.46	0 00:45:31	0.95	0 00:37:08
79	2.36	87.00	1.2500	489.00	37.00	2.95	0 00:46:27	6.65	0 00:37:54
79A	0.60	87.00	0.5000	267.50	37.00	0.80	0 00:38:31	1.78	0 00:31:25
79B	2.64	87.00	0.5000	695.00	37.00	3.14	0 00:52:55	7.10	0 00:43:10
79C	1.43	87.00	0.5000	572.21	40.00	1.97	0 00:40:01	4.30	0 00:32:39
80	1.68	65.00	0.4800	904.42	37.00	1.55	0 00:34:50	3.36	0 00:28:25
81	3.87	87.00	1.3300	653.00	37.00	4.64	0 00:51:32	10.51	0 00:42:02
83	1.35	87.00	1.2100	203.00	50.00	1.94	0 00:49:24	4.05	0 00:40:18
83A	0.18	87.00	0.5000	727.13	70.00	0.39	0 00:06:31	0.69	0 00:05:19
83B	0.67	87.00	0.5000	145.00	50.00	0.95	0 00:51:55	1.99	0 00:42:21
84	0.47	87.00	0.5000	152.93	37.00	0.58	0 00:46:26	1.31	0 00:37:53
84A	0.29	87.00	0.5000	168.70	60.00	0.56	0 00:25:17	1.06	0 00:20:37
84B	0.31	87.00	0.5000	184.41	60.00	0.59	0 00:24:41	1.11	0 00:20:08
84C	0.24	87.00	0.5000	214.28	50.00	0.44	0 00:22:16	0.85	0 00:18:10
84D	0.05	87.00	0.5000	100.00	37.00	0.09	0 00:16:13	0.18	0 00:13:13
84E	0.09	87.00	0.5000	57.83	40.00	0.13	0 00:29:27	0.28	0 00:24:02
84F	0.24	87.00	0.5000	100.00	50.00	0.39	0 00:35:07	0.79	0 00:28:39
84G	0.37	87.00	0.5000	390.96	37.00	0.59	0 00:22:51	1.22	0 00:18:38
84H	0.06	87.00	0.5000	205.81	37.00	0.11	0 00:11:25	0.21	0 00:09:18
85	0.31	87.00	3.5100	217.00	37.00	0.55	0 00:16:28	1.08	0 00:13:26
86	0.86	87.00	0.5900	293.00	37.00	1.10	0 00:43:05	2.47	0 00:35:09
87	1.03	87.00	0.2000	764.93	37.00	1.40	0 00:37:27	3.10	0 00:30:33
88	0.86	87.00	4.3700	2374.91	37.00	1.66	0 00:06:45	3.08	0 00:05:30
89	0.30	87.00	0.3900	368.31	37.00	0.49	0 00:22:39	1.00	0 00:18:28
90	0.73	87.00	2.7500	619.00	37.00	1.30	0 00:15:45	2.53	0 00:12:51
91	1.09	87.00	2.3600	849.00	37.00	1.89	0 00:17:18	3.73	0 00:14:07
92	0.49	87.00	3.5500	566.61	37.00	0.90	0 00:12:01	1.71	0 00:09:48
93	23.72	70.00	3.4400	1970.00	0.00	1.50	0 01:18:14	15.57	0 01:03:50

Table 6
Basin Characteristics and Estimated Flows

Basin ID	Area (acres)	Weighted Curve Number	Average Slope (%)	Equivalent Width (ft)	Impervious Area (%)	5-Year Storm Peak Runoff (cfs)	5-Year Storm Time Of Concentration (D H:M:S)	100-Year Storm Peak Runoff (cfs)	100-Year Storm Time Of Concentration (D H:M:S)
94	2.42	70.00	4.2000	610.00	37.00	2.24	0 00:28:41	5.64	0 00:23:24
96	20.57	70.00	9.9400	1417.00	0.00	1.57	0 01:03:39	16.96	0 00:51:56
97	30.42	70.00	6.8000	2170.00	0.00	2.13	0 01:09:51	22.72	0 00:56:59
98	35.66	70.00	12.8900	4615.00	0.00	3.96	0 00:40:20	43.00	0 00:32:54
99	2.33	87.00	2.1400	437.00	37.00	3.02	0 00:41:56	6.77	0 00:34:13
100	2.32	87.00	0.8700	140.00	37.00	2.95	0 01:48:26	6.73	0 01:28:28
101	2.31	87.00	1.2700	391.00	37.00	2.76	0 00:52:09	6.25	0 00:42:32
102	4.08	87.00	1.5700	691.00	37.00	4.99	0 00:48:54	11.28	0 00:39:54
103	1.82	87.00	1.7400	345.00	37.00	2.31	0 00:44:18	5.19	0 00:36:08
104	0.54	87.00	1.4000	246.00	37.00	0.81	0 00:27:51	1.72	0 00:22:43
105	0.21	87.00	0.8600	231.00	37.00	0.36	0 00:19:12	0.72	0 00:15:40
106	0.48	87.00	4.9500	893.85	37.00	0.92	0 00:08:15	1.72	0 00:06:44
107	0.86	87.00	5.6900	251.00	37.00	1.37	0 00:24:02	2.84	0 00:19:36
108	21.02	87.00	1.3700	1188.00	37.00	19.67	0 01:38:28	43.36	0 01:20:20
110	1.41	87.00	1.2500	265.00	37.00	1.72	0 00:49:12	3.89	0 00:40:08
111	3.74	87.00	1.8700	516.00	37.00	4.45	0 00:52:28	10.09	0 00:42:48
112	4.24	82.00	1.2200	233.02	37.00	3.62	0 01:43:38	7.79	0 01:24:33
113	4.13	82.00	2.3800	2020.62	37.00	5.44	0 00:22:51	12.58	0 00:18:38
114	2.21	87.00	2.3400	874.47	37.00	3.42	0 00:26:06	7.19	0 00:21:18
115	4.39	87.00	1.6500	1012.67	37.00	5.79	0 00:40:02	12.92	0 00:32:39
116	2.79	87.00	1.8300	349.91	37.00	3.24	0 00:55:55	7.35	0 00:45:37
117	0.67	87.00	0.8100	327.00	37.00	0.96	0 00:31:32	2.09	0 00:25:44
118	0.26	87.00	1.1400	438.00	37.00	0.48	0 00:13:39	0.92	0 00:11:08
119	0.19	87.00	3.1200	225.00	37.00	0.36	0 00:12:33	0.68	0 00:10:14
120	3.25	87.00	2.5600	781.00	37.00	4.55	0 00:34:13	9.96	0 00:27:55
121	1.87	87.00	2.9900	601.00	37.00	2.84	0 00:27:27	6.02	0 00:22:23
122	0.86	87.00	2.3400	587.79	37.00	1.46	0 00:18:46	2.92	0 00:15:18
123	1.05	87.00	2.2200	586.82	37.00	1.73	0 00:21:34	3.52	0 00:17:35
124	0.86	87.00	1.9000	225.00	37.00	1.19	0 00:35:42	2.63	0 00:29:08
125	4.66	82.00	1.0900	1273.97	37.00	5.15	0 00:40:57	12.37	0 00:33:24
126	4.46	82.00	1.0000	364.86	37.00	4.04	0 01:26:38	8.89	0 01:10:40
127	9.22	82.00	1.7600	930.00	15.00	4.44	0 01:17:12	14.31	0 01:02:59
128	4.15	87.00	1.7100	682.00	25.00	3.95	0 00:53:53	9.98	0 00:43:57
129	1.34	87.00	2.0400	735.00	37.00	2.17	0 00:22:18	4.45	0 00:18:12
130	0.68	87.00	2.9000	515.95	37.00	1.19	0 00:16:32	2.34	0 00:13:29
131	1.73	87.00	1.0900	731.41	37.00	2.50	0 00:31:34	5.42	0 00:25:45
132	14.21	84.00	2.3700	1688.00	37.00	15.39	0 00:53:29	35.87	0 00:43:38
133	8.62	84.00	2.4000	1669.00	37.00	10.23	0 00:39:44	24.00	0 00:32:25
134	12.05	84.00	2.3600	1692.00	37.00	13.44	0 00:48:26	31.50	0 00:39:31
135	9.04	84.00	5.8900	452.88	37.00	9.09	0 01:08:20	20.74	0 00:55:45
136	6.01	70.00	1.5400	642.00	0.00	0.35	0 01:25:38	3.54	0 01:09:52
137	0.66	87.00	3.1400	200.00	37.00	0.99	0 00:27:55	2.10	0 00:22:47
138	3.92	87.00	1.6300	1837.04	37.00	6.04	0 00:26:16	12.72	0 00:21:26
139	2.22	87.00	1.8300	1687.58	37.00	3.77	0 00:18:57	7.53	0 00:15:28
140	6.03	87.00	1.5200	748.00	37.00	6.86	0 00:59:33	15.53	0 00:48:35
141	4.90	87.00	0.2800	1043.00	37.00	5.20	0 01:11:31	11.70	0 00:58:20
142	4.88	87.00	0.9600	1640.82	37.00	6.60	0 00:37:34	14.61	0 00:30:39
143	3.69	87.00	2.0300	486.00	37.00	4.39	0 00:52:39	9.94	0 00:42:57
144	4.84	87.00	2.5600	486.00	37.00	5.56	0 00:57:47	12.60	0 00:47:08
145	0.86	87.00	0.2100	777.72	37.00	1.22	0 00:32:44	2.67	0 00:26:42
146	2.50	95.00	1.1500	961.00	85.00	5.98	0 00:13:53	10.19	0 00:11:20
147	4.72	87.00	1.6500	663.00	85.00	9.89	0 00:22:46	17.76	0 00:18:35
148	1.94	87.00	2.3100	274.73	37.00	2.38	0 00:48:27	5.37	0 00:39:32
149	8.45	87.00	2.4000	670.00	37.00	9.15	0 01:07:54	20.64	0 00:55:24
150	2.20	87.00	1.5800	761.00	37.00	3.17	0 00:31:50	6.87	0 00:25:58
151	5.07	87.00	0.5100	640.00	37.00	5.12	0 01:21:48	11.43	0 01:06:44
152	2.45	87.00	1.2700	711.00	75.00	5.17	0 00:21:41	9.30	0 00:17:41
153	23.21	84.00	1.5000	1343.56	37.00	20.99	0 01:34:27	46.15	0 01:17:03

Table 6
Basin Characteristics and Estimated Flows

Basin ID	Area (acres)	Weighted Curve Number	Average Slope (%)	Equivalent Width (ft)	Impervious Area (%)	5-Year Storm Peak Runoff (cfs)	5-Year Storm Time Of Concentration (D H:M:S)	100-Year Storm Peak Runoff (cfs)	100-Year Storm Time Of Concentration (D H:M:S)
154	5.46	87.00	2.0300	496.69	37.00	5.99	0 01:05:47	13.52	0 00:53:40
155	5.32	87.00	1.7400	1735.57	37.00	7.64	0 00:32:01	16.59	0 00:26:07
156	7.22	87.00	1.9600	1124.00	85.00	15.57	0 00:20:21	27.66	0 00:16:36
157	5.53	84.00	2.3500	936.00	37.00	6.39	0 00:43:22	15.00	0 00:35:23
159	8.22	95.00	2.1000	1143.00	85.00	18.48	0 00:21:20	32.22	0 00:17:24
160	2.14	84.00	2.5100	636.00	37.00	2.78	0 00:30:19	6.39	0 00:24:44
161	5.30	95.00	2.1700	1567.00	50.00	11.21	0 00:27:40	20.06	0 00:22:34
162	22.97	84.00	1.5600	2311.00	37.00	23.24	0 01:06:59	53.11	0 00:54:39
163	0.70	87.00	0.7100	179.00	37.00	0.86	0 00:48:23	1.94	0 00:39:28
164	0.27	87.00	2.2900	219.00	50.00	0.53	0 00:14:53	0.98	0 00:12:08
165	1.42	87.00	0.5300	379.00	37.00	1.71	0 00:51:37	3.86	0 00:42:07
166	1.62	87.00	0.7600	281.00	37.00	1.84	0 01:00:01	4.17	0 00:48:58
167	0.17	87.00	0.5300	337.77	37.00	0.30	0 00:15:25	0.59	0 00:12:34
168	3.22	85.50	1.8900	374.00	37.00	3.54	0 00:58:00	8.12	0 00:47:19
169	0.35	87.00	1.6800	210.56	37.00	0.56	0 00:22:13	1.15	0 00:18:07
170	3.25	87.00	2.1100	711.00	37.00	4.36	0 00:38:25	9.69	0 00:31:20
173	6.54	87.00	1.1700	566.00	37.00	6.65	0 01:19:55	14.88	0 01:05:12
174	5.26	87.00	2.5200	848.00	37.00	6.71	0 00:43:43	15.08	0 00:35:39
176	2.21	87.00	0.6400	480.00	37.00	2.58	0 00:55:06	5.85	0 00:44:57
177	1.29	87.00	1.8600	277.00	37.00	1.70	0 00:40:20	3.79	0 00:32:54
178	1.70	87.00	2.6500	500.00	37.00	2.50	0 00:30:01	5.37	0 00:24:29
179	0.64	85.00	0.4900	200.00	37.00	0.74	0 00:48:10	1.72	0 00:39:18
180	1.89	87.00	0.6600	828.00	37.00	2.60	0 00:35:50	5.72	0 00:29:14
181	0.78	87.00	0.3600	121.00	50.00	0.99	0 01:09:42	2.08	0 00:56:52
182	0.17	87.00	0.8300	361.00	37.00	0.32	0 00:13:05	0.60	0 00:10:40
183	5.38	84.00	0.4900	499.00	37.00	4.77	0 01:39:35	10.44	0 01:21:15
185	3.44	87.00	0.5200	530.01	37.00	3.64	0 01:12:04	8.18	0 00:58:48
186	3.46	87.00	0.2400	827.00	37.00	3.71	0 01:09:53	8.35	0 00:57:01
187	20.35	87.00	2.2000	1582.00	37.00	21.72	0 01:10:32	48.92	0 00:57:33
188	0.89	87.00	1.2300	405.00	37.00	1.33	0 00:29:08	2.84	0 00:23:46
189	0.41	87.00	1.2800	235.00	37.00	0.65	0 00:25:08	1.35	0 00:20:30
190	1.88	87.00	0.2200	2122.90	37.00	2.83	0 00:28:16	6.02	0 00:23:04
191	6.15	75.00	0.8300	1454.00	37.00	5.76	0 00:48:29	13.45	0 00:39:33
192	4.82	70.00	1.4200	1743.42	0.00	0.51	0 00:42:10	5.64	0 00:34:24
193	3.58	70.00	1.3500	1260.00	37.00	3.30	0 00:32:58	8.01	0 00:26:54
194	48.39	70.00	3.5000	965.00	0.00	1.47	0 03:03:11	10.54	0 02:29:27
195	8.36	87.00	0.5900	377.00	37.00	6.58	0 02:25:11	14.06	0 01:58:26
196	0.35	87.00	1.4800	620.00	50.00	0.70	0 00:10:35	1.28	0 00:08:38
197	0.93	87.00	0.5200	1773.86	50.00	1.83	0 00:13:54	3.39	0 00:11:20
198	3.77	84.00	0.7400	441.00	37.00	3.66	0 01:16:32	8.24	0 01:02:26
199	3.44	84.00	0.4000	271.00	10.00	1.03	0 02:24:30	3.28	0 01:57:53
200	1.50	82.00	2.1500	326.00	37.00	1.69	0 00:38:21	4.07	0 00:31:17
201	4.42	87.00	0.3900	887.00	37.00	4.81	0 01:07:07	10.85	0 00:54:46
202	0.24	82.00	0.8200	243.00	50.00	0.40	0 00:17:44	0.81	0 00:14:28
203	0.62	82.00	0.3800	273.00	50.00	0.87	0 00:36:44	1.87	0 00:29:58
204	4.94	82.00	1.7000	556.00	37.00	4.93	0 01:01:03	11.40	0 00:49:48
205	1.50	82.00	1.5400	285.00	50.00	2.06	0 00:39:55	4.43	0 00:32:34
206	13.02	82.00	1.6000	951.00	37.00	12.06	0 01:20:34	26.79	0 01:05:44
207	4.16	82.00	0.5700	398.00	37.00	3.68	0 01:33:20	8.02	0 01:16:08
208	0.50	87.00	0.1300	944.03	50.00	0.91	0 00:21:04	1.75	0 00:17:11
209	13.29	82.00	5.0000	989.00	85.00	26.59	0 00:23:55	48.75	0 00:19:31
210	1.19	87.00	0.1500	829.00	50.00	1.87	0 00:36:48	3.84	0 00:30:01
211	1.21	87.00	1.3300	435.00	37.00	1.72	0 00:32:45	3.76	0 00:26:43
212	2.13	82.00	0.4800	621.00	37.00	2.23	0 00:50:21	5.27	0 00:41:05
213	1.80	95.00	0.2800	260.00	75.00	3.19	0 00:51:54	5.96	0 00:42:20
214	7.58	82.00	0.7400	665.00	37.00	6.76	0 01:30:57	14.79	0 01:14:12
215	4.97	87.00	0.7800	1536.00	37.00	6.43	0 00:42:03	14.41	0 00:34:18
216	1.09	95.00	1.4100	213.00	75.00	2.42	0 00:26:36	4.24	0 00:21:42

Table 6
Basin Characteristics and Estimated Flows

Basin ID	Area (acres)	Weighted Curve Number	Average Slope (%)	Equivalent Width (ft)	Impervious Area (%)	5-Year Storm Peak Runoff (cfs)	5-Year Storm Time Of Concentration (D H:M:S)	100-Year Storm Peak Runoff (cfs)	100-Year Storm Time Of Concentration (D H:M:S)
217	0.38	95.00	0.7000	285.00	75.00	0.92	0 00:14:46	1.56	0 00:12:03
218	0.26	95.00	0.2200	150.00	75.00	0.58	0 00:24:11	1.02	0 00:19:44
219	1.24	95.00	0.4100	486.00	75.00	2.77	0 00:25:22	4.85	0 00:20:42
220	1.00	95.00	0.6100	489.00	70.00	2.28	0 00:21:59	3.96	0 00:17:56
221	5.82	82.00	1.0000	896.00	70.00	9.89	0 00:38:00	19.33	0 00:31:00
222	3.32	95.00	0.3100	548.00	75.00	6.19	0 00:46:25	11.41	0 00:37:52
223	0.53	95.00	0.6700	115.00	75.00	1.13	0 00:31:13	2.01	0 00:25:28
224	2.30	75.00	0.7100	1250.00	75.00	4.36	0 00:17:41	8.28	0 00:14:26
225	1.73	95.00	0.2800	399.00	75.00	7.17	0 00:39:07	13.70	0 00:31:54
226	1.01	87.00	0.6700	338.00	75.00	2.09	0 00:24:07	3.79	0 00:19:40
227	0.38	95.00	1.1000	456.00	75.00	0.92	0 00:09:41	1.56	0 00:07:54
228	0.62	95.00	0.5300	569.00	75.00	1.47	0 00:14:04	2.51	0 00:11:29
229	0.98	87.00	1.1400	272.00	75.00	2.04	0 00:22:57	3.68	0 00:18:43
230	0.62	95.00	0.3800	520.00	75.00	1.47	0 00:16:28	2.51	0 00:13:26
231	1.46	95.00	0.1000	578.00	75.00	2.94	0 00:38:37	5.31	0 00:31:30
232	1.17	95.00	0.1800	558.00	75.00	2.56	0 00:28:56	4.51	0 00:23:37
233	2.48	95.00	0.2800	586.00	85.00	5.17	0 00:28:25	9.22	0 00:23:11
241	7.24	87.00	1.5900	689.00	85.00	14.06	0 00:29:06	25.89	0 00:23:45
242	34.63	84.00	2.1100	2130.00	37.00	32.85	0 01:22:12	73.36	0 01:07:04
242A	1.63	87.00	0.5000	531.22	37.00	2.04	0 00:46:37	4.59	0 00:38:02
244	15.23	87.00	1.1800	1100.00	85.00	26.50	0 00:37:34	50.29	0 00:30:39
245	30.66	95.00	1.3100	2200.00	70.00	53.92	0 00:55:24	100.90	0 00:45:12
246	7.34	95.00	1.2100	446.00	85.00	13.00	0 00:41:21	24.13	0 00:33:44
247	6.49	87.00	2.1000	708.00	37.00	7.44	0 00:58:23	16.84	0 00:47:38
248	5.38	87.00	2.1000	753.00	37.00	6.51	0 00:50:15	14.73	0 00:40:59
249	6.79	75.00	2.1000	610.00	37.00	6.13	0 01:05:36	13.38	0 00:53:31
250	1.43	75.00	3.8000	270.00	37.00	1.38	0 00:35:12	3.47	0 00:28:43
250A	0.06	87.00	0.5000	261.49	90.00	0.14	0 00:03:49	0.24	0 00:03:07
252	2.68	92.00	3.8000	357.02	37.00	4.19	0 00:43:19	8.47	0 00:35:21
252A	0.42	92.00	0.5000	304.00	90.00	1.02	0 00:11:30	1.73	0 00:09:23
252B	0.70	65.00	1.0000	508.00	90.00	1.57	0 00:09:18	2.75	0 00:07:35
252C	3.86	65.00	1.5000	468.00	37.00	3.45	0 01:00:34	6.71	0 00:49:24
252D	0.27	75.00	1.5000	336.00	90.00	0.63	0 00:05:58	1.08	0 00:04:52
254	5.24	87.00	1.3500	621.00	85.00	10.47	0 00:26:48	19.11	0 00:21:52
255	4.26	87.00	1.1400	400.00	85.00	7.93	0 00:32:26	14.78	0 00:26:27
258	1.11	95.00	0.7200	558.00	85.00	2.66	0 00:13:35	4.52	0 00:11:05
263	0.11	87.00	1.0000	159.00	90.00	0.27	0 00:06:09	0.45	0 00:05:01
264	1.93	84.00	0.7100	559.00	85.00	4.14	0 00:19:02	7.39	0 00:15:31
266	0.52	87.00	1.2300	243.00	37.00	0.78	0 00:28:47	1.67	0 00:23:29
267	0.61	87.00	0.9800	409.00	37.00	0.96	0 00:24:43	2.01	0 00:20:10
268	0.18	87.00	2.3100	216.00	70.00	0.40	0 00:08:40	0.70	0 00:07:04
269	0.38	95.00	0.4800	413.00	70.00	0.91	0 00:14:45	1.56	0 00:12:02
270	0.72	87.00	0.2000	103.00	70.00	1.04	0 01:04:08	2.08	0 00:52:19
273	0.38	87.00	0.3400	531.84	37.00	0.63	0 00:21:56	1.28	0 00:17:54
274	0.24	87.00	0.9600	537.20	90.00	0.84	0 00:04:46	1.42	0 00:03:53
300	0.17	87.00	0.5000	539.98	37.00	0.31	0 00:11:45	0.59	0 00:09:35
300A	0.05	87.00	0.5000	72.00	90.00	0.13	0 00:07:57	0.22	0 00:06:29
321	0.18	87.00	0.2200	76.73	70.00	0.33	0 00:31:56	0.63	0 00:26:03
321A	0.69	87.00	0.5000	243.00	40.00	0.92	0 00:43:09	2.02	0 00:35:12
321B	0.09	87.00	0.5000	60.00	80.00	0.20	0 00:15:11	0.35	0 00:12:23
321C	0.85	87.00	0.5000	205.00	37.00	0.99	0 00:55:39	2.24	0 00:45:24
321D	0.38	87.00	0.5000	100.00	70.00	0.71	0 00:34:03	1.35	0 00:27:47
321E	0.09	87.00	0.5000	233.09	85.00	0.22	0 00:05:51	0.38	0 00:04:46
321F	0.15	87.00	0.5000	60.00	80.00	0.33	0 00:20:47	0.58	0 00:16:57
321G	0.16	87.00	0.5000	132.51	37.00	0.25	0 00:26:48	0.52	0 00:21:52
321H	0.19	87.00	0.5000	160.84	80.00	0.42	0 00:13:01	0.73	0 00:10:37
321I	0.38	87.00	0.5000	198.10	37.00	0.53	0 00:35:16	1.17	0 00:28:47
321J	0.29	87.00	0.5000	590.19	50.00	0.57	0 00:13:32	1.06	0 00:11:02

Table 6
Basin Characteristics and Estimated Flows

Basin ID	Area (acres)	Weighted Curve Number	Average Slope (%)	Equivalent Width (ft)	Impervious Area (%)	5-Year Storm Peak Runoff (cfs)	5-Year Storm Time Of Concentration (D H:M:S)	100-Year Storm Peak Runoff (cfs)	100-Year Storm Time Of Concentration (D H:M:S)
325	3.40	87.00	0.7700	783.00	37.00	4.12	0 00:50:23	9.31	0 00:41:06
325A	2.38	87.00	0.5000	752.00	37.00	2.94	0 00:47:22	6.64	0 00:38:39
331	2.63	92.00	6.5000	346.00	37.00	4.37	0 00:37:11	8.68	0 00:30:20
331A	0.14	75.00	0.5000	121.00	90.00	0.33	0 00:10:27	0.57	0 00:08:31
331B	0.12	75.00	0.5000	407.62	90.00	0.28	0 00:04:30	0.47	0 00:03:40
331C	0.29	75.00	1.5000	421.00	90.00	0.67	0 00:05:22	1.14	0 00:04:23
346	3.92	87.00	0.5000	500.00	37.00	3.96	0 01:21:48	8.84	0 01:06:44
347	0.39	95.00	0.5000	148.00	50.00	0.76	0 00:36:44	1.39	0 00:29:58
348	1.17	95.00	0.5000	388.00	50.00	2.26	0 00:40:07	4.14	0 00:32:44
349	0.33	95.00	0.5000	179.00	50.00	0.68	0 00:29:38	1.22	0 00:24:10
349A	0.15	87.00	0.5000	165.88	37.00	0.24	0 00:21:59	0.49	0 00:17:56
350	0.48	95.00	0.5000	348.00	50.00	1.04	0 00:25:13	1.85	0 00:20:34
351	0.95	95.00	0.5000	265.00	50.00	1.77	0 00:44:24	3.27	0 00:36:13
352	2.15	75.00	0.5000	500.00	37.00	1.98	0 00:56:59	4.44	0 00:46:29
353	5.88	65.00	2.7000	561.00	40.00	5.68	0 00:56:58	11.00	0 00:46:28
354	19.67	84.00	0.5000	1700.00	50.00	21.56	0 01:29:52	45.13	0 01:13:19
355	9.53	84.00	0.5000	370.19	50.00	8.66	0 02:25:16	17.54	0 01:58:30
356	3.07	87.00	0.5000	276.00	37.00	2.85	0 01:40:54	6.26	0 01:22:19
365	4.04	87.00	0.5000	1567.84	40.00	5.52	0 00:40:45	12.07	0 00:33:14
366	0.95	95.00	0.5000	500.00	75.00	2.20	0 00:20:01	3.80	0 00:16:20
367	0.55	95.00	0.5000	100.00	70.00	1.08	0 00:42:16	1.96	0 00:34:29
368	0.37	95.00	0.5000	134.00	70.00	0.82	0 00:28:03	1.44	0 00:22:53
369	0.17	95.00	1.0000	123.00	70.00	0.41	0 00:15:06	0.70	0 00:12:19
369A	0.15	95.00	0.5000	295.40	40.00	0.34	0 00:15:22	0.59	0 00:12:32
369B	0.35	87.00	0.5000	347.35	90.00	0.84	0 00:09:28	1.42	0 00:07:43
370	0.95	95.00	1.0000	878.66	70.00	2.27	0 00:12:58	3.87	0 00:10:35
375	33.54	87.00	0.5000	4170.50	37.00	33.63	0 01:23:00	75.03	0 01:07:43
375A	0.81	75.00	1.6000	588.00	70.00	1.63	0 00:13:01	2.89	0 00:10:37
376	26.01	87.00	0.5000	1909.00	37.00	22.83	0 01:53:53	49.81	0 01:32:55
377	0.53	87.00	1.0000	230.00	60.00	1.01	0 00:24:12	1.90	0 00:19:45
378	1.45	95.00	1.1000	631.00	60.00	3.24	0 00:23:32	5.68	0 00:19:12
379	1.04	95.00	3.0000	440.00	50.00	2.30	0 00:20:11	4.05	0 00:16:28
381	0.33	95.00	1.0000	150.00	70.00	0.77	0 00:19:58	1.33	0 00:16:17
418	0.39	87.00	3.0000	220.00	50.00	0.74	0 00:16:59	1.39	0 00:13:51
419	0.09	87.00	0.5000	80.00	60.00	0.18	0 00:19:24	0.33	0 00:15:49
420	0.25	87.00	0.5000	456.61	50.00	0.48	0 00:14:17	0.89	0 00:11:39
421	0.11	87.00	0.5000	87.00	70.00	0.23	0 00:17:32	0.42	0 00:14:18
424	0.44	87.00	0.5000	304.00	50.00	0.77	0 00:25:49	1.51	0 00:21:03
425	0.52	87.00	0.5000	304.00	40.00	0.77	0 00:31:53	1.65	0 00:26:00
440	0.24	87.00	1.0000	458.95	60.00	0.51	0 00:10:01	0.91	0 00:08:10
441	2.83	65.00	3.0000	375.61	37.00	2.58	0 00:46:36	5.25	0 00:38:01
442	0.08	87.00	0.5000	140.00	90.00	0.19	0 00:06:43	0.32	0 00:05:29
456	1.94	65.00	2.0000	988.96	37.00	1.80	0 00:23:29	4.32	0 00:19:10
457	1.69	65.00	2.0000	940.91	37.00	1.57	0 00:22:17	3.81	0 00:18:11
461	0.25	87.00	0.5000	331.97	37.00	0.43	0 00:20:16	0.86	0 00:16:32
467	1.74	87.00	0.5000	217.00	37.00	1.75	0 01:22:59	3.90	0 01:07:42
468	48.27	87.00	0.5000	5333.14	37.00	47.05	0 01:29:06	104.47	0 01:12:41
472	0.17	80.00	0.5000	67.44	25.00	0.12	0 00:45:09	0.36	0 00:36:50
473	1.19	80.00	0.5000	209.12	25.00	0.80	0 01:15:04	2.02	0 01:01:14

Table 7

Culvert Analysis Results, 5-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Peak Flow Entering Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Pipe Bypass Flow (cfs)	Reported Condition Under Design Storm Flows
1	52.06	11.01%	24	0.024	18.89	18.89	10.39	2.00	2.97	0.00	Investigate
2	39.67	3.86%	24	0.024	10.51	10.51	5.40	2.00	1.69	N/A	Sufficient
3	39.45	1.60%	18	0.024	10.21	10.21	7.51	1.50	2.55	0.08	Investigate
6	41.63	3.27%	18	0.024	4.78	4.78	5.78	1.50	1.32	N/A	Sufficient
7	85.44	3.11%	15	0.024	43.22	8.67	7.42	1.25	4.25	34.55	Investigate
8	33.76	2.58%	15	0.024	3.32	3.32	4.33	1.25	1.18	N/A	Sufficient
9	59.27	2.45%	18	0.024	12.81	12.81	8.42	1.50	3.98	N/A	Investigate
10	59.52	1.18%	24	0.024	1.05	1.05	2.67	2.00	0.45	N/A	Sufficient
11	36.2	6.10%	24	0.024	7.54	7.54	5.63	2.00	1.44	N/A	Sufficient
12	32.87	0.30%	24	0.024	3.96	3.96	3.51	2.00	0.98	N/A	Sufficient
13	39.82	5.42%	18	0.024	1.36	1.36	4.52	1.50	0.49	N/A	Sufficient
15	63.54	7.79%	12	0.024	1.72	1.72	4.34	1.00	0.86	N/A	Sufficient
16	73.79	5.64%	18	0.024	12.08	12.08	7.41	1.50	3.35	N/A	Investigate
17	93.38	4.71%	18	0.024	4.40	4.40	4.18	1.50	1.25	N/A	Sufficient
19	51.12	0.18%	12	0.024	6.38	2.63	3.35	1.00	3.42	3.75	Investigate
20	39.67	2.24%	18	0.024	12.97	12.97	8.95	1.50	3.80	N/A	Investigate
21	39.74	1.74%	12	0.024	5.18	4.82	6.14	1.00	4.03	0.36	Investigate
22	39.04	0.44%	15	0.024	20.54	6.92	5.64	1.25	4.38	13.62	Investigate
24	26.88	2.27%	8	0.024	3.65	2.26	7.23	0.67	4.06	1.39	Investigate
25	39.62	3.61%	15	0.024	6.27	6.27	6.22	1.25	2.10	N/A	Investigate
26	43.85	2.33%	15	0.024	5.63	5.63	5.38	1.25	1.83	N/A	Investigate
27	35.77	1.71%	24	0.024	9.98	9.98	5.77	2.00	1.81	N/A	Sufficient
28	48.43	5.58%	24	0.024	4.98	4.98	2.61	2.00	1.00	N/A	Sufficient
29	97.63	1.93%	24	0.024	5.67	5.68	4.86	2.00	1.09	N/A	Sufficient
30	87.02	6.15%	24	0.024	12.95	12.95	7.41	2.00	2.18	N/A	Investigate
46	46.08	1.82%	12	0.024	5.14	4.81	7.54	1.00	4.04	0.33	Investigate
47	44.79	1.81%	12	0.024	9.89	4.36	8.09	1.00	4.00	5.53	Investigate
48	23.58	1.99%	15	0.024	19.41	10.48	9.04	1.25	4.08	8.93	Investigate
49	54.52	1.27%	15	0.024	11.12	7.09	8.23	1.25	4.19	4.03	Investigate
50	39.82	2.81%	15	0.024	2.65	2.65	2.27	1.25	2.81	N/A	Investigate

Table 7
Culvert Analysis Results, 5-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Peak Flow Entering Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Pipe Bypass Flow (cfs)	Reported Condition Under Design Storm Flows
54	42.65	1.29%	12	0.024	2.59	2.59	5.53	1.00	1.85	N/A	Investigate
55	51.59	0.29%	12	0.024	15.85	4.38	5.91	1.00	3.66	11.47	Investigate
60	106.96	0.81%	24	0.024	28.32	7.94	3.73	2.00	3.56	20.38	Investigate
61	35.69	0.50%	15	0.024	21.54	8.71	8.82	1.25	4.15	12.83	Investigate
63	46.36	1.42%	24	0.024	20.03	20.03	8.55	2.00	3.31	N/A	Investigate
65	49.9	1.42%	24	0.024	1.49	1.49	3.10	2.00	0.48	N/A	Sufficient
66	21	4.43%	36	0.024	77.18	63.41	8.97	3.00	4.08	13.77	Investigate
67	163.25	0.89%	24	0.024	50.28	21.17	8.98	2.00	6.89	29.11	Investigate
68	59.78	0.72%	18	0.024	7.92	7.92	5.59	1.50	3.78	N/A	Investigate
73	70.13	1.80%	18	0.024	6.53	6.53	6.29	1.50	1.91	N/A	Investigate
79	43.84	0.57%	24	0.024	14.29	14.29	4.55	2.00	2.87	N/A	Investigate
80	135.47	0.95%	24	0.024	13.63	13.63	5.93	2.00	2.44	N/A	Investigate
83	49.98	3.08%	24	0.024	17.74	17.74	9.82	2.00	1.38	N/A	Sufficient
84	70	1.37%	24	0.024	17.18	17.18	7.09	2.00	2.76	N/A	Investigate
86	179.61	1.45%	18	0.015	8.77	8.77	5.01	1.50	1.82	N/A	Investigate
86A	53.07	2.20%	12	0.015	8.97	7.04	8.97	1.00	4.06	1.93	Investigate
90	59	2.76%	18	0.024	5.49	5.49	5.77	1.50	1.48	N/A	Sufficient
100	19.66	1.02%	12	0.024	2.20	2.20	3.43	1.00	1.07	N/A	Investigate
101	19.31	0.16%	12	0.024	2.66	2.66	6.24	1.00	3.84	N/A	Investigate
102	60.19	1.20%	18	0.024	2.58	2.58	5.24	1.50	0.88	N/A	Sufficient
103	19.82	0.81%	12	0.024	0.07	0.07	0.56	1.00	0.17	N/A	Sufficient
104	39.81	0.78%	12	0.024	5.02	3.85	7.89	1.00	4.01	1.17	Investigate
105	110.75	0.65%	36	0.024	96.80	51.07	9.70	3.00	4.83	45.73	Investigate
106	19.52	1.69%	24	0.024	109.60	22.72	8.93	2.00	3.50	86.88	Investigate
107	85.83	0.96%	36	0.024	41.02	41.02	7.51	3.00	3.70	N/A	Investigate
109	19.52	1.54%	12	0.024	2.91	2.91	6.30	1.00	1.97	N/A	Investigate
112	57.72	3.48%	24	0.024	11.39	11.39	6.31	2.00	1.99	N/A	Sufficient
113	44.08	0.93%	24	0.024	1.08	1.08	3.28	2.00	0.43	N/A	Sufficient
123	47.73	2.26%	18	0.024	20.33	11.76	9.79	1.50	4.14	8.57	Investigate
138A	41.95	2.19%	15	0.024	1.76	1.76	2.75	1.25	0.74	N/A	Sufficient

Table 7
Culvert Analysis Results, 5-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Peak Flow Entering Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Pipe Bypass Flow (cfs)	Reported Condition Under Design Storm Flows
139A	39.78	2.61%	18	0.024	4.88	4.88	5.56	1.50	1.36	N/A	Sufficient
142	55.17	0.69%	24	0.024	9.98	9.98	3.49	2.00	1.82	N/A	Sufficient
142A	24	2.54%	12	0.024	0.11	0.11	2.83	1.00	0.20	N/A	Sufficient
143	70.89	3.20%	12	0.024	56.80	2.21	5.23	1.00	2.39	54.59	Investigate
144	89.47	2.28%	12	0.024	3.84	3.84	6.38	1.00	3.65	N/A	Investigate
145	49.72	1.47%	24	0.024	55.47	22.05	9.55	2.00	3.79	33.42	Investigate
145A	19.71	3.30%	18	0.024	8.49	8.49	5.54	1.50	2.36	N/A	Investigate
149	72.68	2.93%	24	0.024	55.84	24.46	10.32	2.00	4.40	31.38	Investigate
170	53.99	0.85%	15	0.024	18.45	8.09	6.73	1.25	4.14	10.36	Investigate
172	38.92	0.57%	24	0.024	14.82	14.82	5.55	2.00	3.57	N/A	Investigate
177	59.99	3.53%	15	0.024	3.32	3.32	4.69	1.25	1.18	N/A	Sufficient
178	55.19	1.92%	24	0.024	4.42	4.42	5.77	2.00	0.95	N/A	Sufficient
210	19.96	1.60%	8	0.015	3.82	2.19	6.38	0.67	1.79	1.63	Investigate
221	23.54	0.76%	12	0.024	53.72	4.28	5.60	1.00	3.31	49.44	Investigate
222	22.68	2.38%	12	0.024	0.00	0.00	0.00	1.00	0.00	N/A	Sufficient
223	34.08	1.61%	15	0.024	0.61	0.61	1.25	1.25	0.35	N/A	Sufficient
224	15.63	0.38%	15	0.024	0.61	0.61	3.14	1.25	0.49	N/A	Sufficient

Table 8
Culvert Analysis Results, 100-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Peak Flow Entering Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Pipe Bypass Flow (cfs)	Reported Condition Under Design Storm Flows	Investigation Priority
1	52.06	11.01%	24	0.024	96.49	21.87	11.89	3.00	3.65	74.62	Investigate	H
2	39.67	3.86%	24	0.024	21.78	21.78	8.78	3.00	3.16	N/A	Investigate	H
3	39.45	1.60%	18	0.024	22.56	13.52	9.35	2.50	4.09	9.04	Investigate	L
6	41.63	3.27%	18	0.024	10.55	10.55	8.83	2.50	2.77	N/A	Investigate	H
7	85.44	3.11%	15	0.024	127.84	8.67	7.44	2.25	4.54	119.17	Investigate	H
8	33.76	2.58%	15	0.024	15.41	9.17	9.69	2.25	4.00	6.24	Investigate	L
9	59.27	2.45%	18	0.024	55.66	13.94	8.54	2.50	4.32	41.72	Investigate	M
10	59.52	1.18%	24	0.024	1.72	1.72	3.19	3.00	0.63	N/A	Sufficient	N/A
11	36.2	6.10%	24	0.024	18.18	18.18	7.93	3.00	2.90	N/A	Sufficient	N/A
12	32.87	0.30%	24	0.024	8.82	8.82	4.34	3.00	1.67	N/A	Sufficient	N/A
13	39.82	5.42%	18	0.024	2.83	2.83	5.08	2.50	0.92	N/A	Sufficient	N/A
15	63.54	7.79%	12	0.024	3.90	3.90	7.01	2.00	1.88	N/A	Sufficient	N/A
16	73.79	5.64%	18	0.024	27.47	13.87	8.01	2.50	4.17	13.60	Investigate	M
17	93.38	4.71%	18	0.024	14.31	14.31	8.10	2.50	4.98	N/A	Investigate	H
19	51.12	0.18%	12	0.024	12.94	2.17	2.77	2.00	3.87	10.77	Investigate	M
20	39.67	2.24%	18	0.024	26.32	13.46	9.36	2.50	4.00	12.86	Investigate	M
21	39.74	1.74%	12	0.024	13.00	4.83	6.14	2.00	4.17	8.17	Investigate	L
22	39.04	0.44%	15	0.024	28.09	6.92	5.64	2.25	4.63	21.17	Investigate	M
24	26.88	2.27%	8	0.024	8.57	2.36	7.20	1.67	4.14	6.21	Investigate	L
25	39.62	3.61%	15	0.024	25.09	9.74	9.01	2.25	4.14	15.35	Investigate	M
26	43.85	2.33%	15	0.024	13.47	9.42	8.11	2.25	4.11	4.05	Investigate	L
27	35.77	1.71%	24	0.024	20.18	19.55	6.27	3.00	4.00	0.63	Investigate	L
28	48.43	5.58%	24	0.024	14.62	8.42	2.96	3.00	3.10	6.20	Investigate	L
29	97.63	1.93%	24	0.024	20.64	20.29	7.96	3.00	4.00	0.35	Investigate	L
30	87.02	6.15%	24	0.024	25.58	25.58	13.04	3.00	7.34	N/A	Investigate	H
46	46.08	1.82%	12	0.024	9.29	5.07	7.53	2.00	4.18	4.22	Investigate	L
47	44.79	1.81%	12	0.024	17.75	4.36	8.10	2.00	4.00	13.39	Investigate	M
48	23.58	1.99%	15	0.024	42.44	10.58	9.20	2.25	4.17	31.86	Investigate	M
49	54.52	1.27%	15	0.024	21.06	7.54	8.55	2.25	4.39	13.52	Investigate	M
50	39.82	2.81%	15	0.024	4.52	4.52	3.68	2.25	3.75	N/A	Investigate	H
54	42.65	1.29%	12	0.024	2.65	2.65	5.64	2.00	1.94	N/A	Sufficient	N/A

Table 8

Culvert Analysis Results, 100-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Peak Flow Entering Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Pipe Bypass Flow (cfs)	Reported Condition Under Design Storm Flows	Investigation Priority
55	51.59	0.29%	12	0.024	44.98	4.43	5.94	2.00	3.82	40.55	Investigate	M
60	106.96	0.81%	24	0.024	80.68	10.01	4.04	3.00	3.83	70.67	Investigate	H
61	35.69	0.50%	15	0.024	45.48	9.24	8.83	2.25	4.28	36.24	Investigate	M
63	46.36	1.42%	24	0.024	50.62	22.43	9.20	3.00	3.89	28.19	Investigate	M
65	49.9	1.42%	24	0.024	3.43	3.43	3.91	3.00	0.82	N/A	Sufficient	N/A
66	21	4.43%	36	0.024	178.18	65.50	9.27	4.00	4.27	112.68	Investigate	H
67	163.25	0.89%	24	0.024	121.55	22.96	8.98	3.00	7.23	98.59	Investigate	H
68	59.78	0.72%	18	0.024	39.99	10.18	5.82	2.50	4.26	29.81	Investigate	M
73	70.13	1.80%	18	0.024	20.34	8.75	7.49	2.50	2.76	11.59	Investigate	M
79	43.84	0.57%	24	0.024	72.29	18.69	5.95	3.00	3.94	53.60	Investigate	H
80	135.47	0.95%	24	0.024	23.91	18.01	7.61	3.00	4.32	5.90	Investigate	L
83	49.98	3.08%	24	0.024	19.40	19.40	7.95	3.00	3.16	N/A	Investigate	H
84	70	1.37%	24	0.024	19.09	19.09	7.74	3.00	3.11	N/A	Investigate	H
86	179.61	1.45%	18	0.015	25.90	13.86	7.84	2.50	4.21	12.04	Investigate	M
86A	53.07	2.20%	12	0.015	48.80	7.41	9.45	2.00	4.37	41.39	Investigate	M
90	59	2.76%	18	0.024	11.86	10.67	8.77	2.50	3.22	1.19	Investigate	L
100	19.66	1.02%	12	0.024	3.79	3.79	5.31	2.00	1.82	N/A	Sufficient	N/A
101	19.31	0.16%	12	0.024	4.85	2.75	6.43	2.00	4.00	2.10	Investigate	L
102	60.19	1.20%	18	0.024	2.75	2.75	5.22	2.50	0.93	N/A	Sufficient	N/A
103	19.82	0.81%	12	0.024	0.07	0.07	0.46	2.00	0.21	N/A	Sufficient	N/A
104	39.81	0.78%	12	0.024	9.08	4.22	8.02	2.00	4.06	4.86	Investigate	L
105	110.75	0.65%	36	0.024	162.21	53.21	9.72	4.00	5.03	109.00	Investigate	H
106	19.52	1.69%	24	0.024	169.59	23.00	8.96	3.00	3.91	146.59	Investigate	H
107	85.83	0.96%	36	0.024	78.18	46.00	8.31	4.00	4.05	32.18	Investigate	M
109	19.52	1.54%	12	0.024	5.29	4.70	9.58	2.00	4.02	0.59	Investigate	L
112	57.72	3.48%	24	0.024	16.26	16.26	7.67	3.00	2.65	N/A	Sufficient	N/A
113	44.08	0.93%	24	0.024	1.96	1.96	3.62	3.00	0.58	N/A	Sufficient	N/A
123	47.73	2.26%	18	0.024	50.76	13.36	9.92	2.50	4.34	37.40	Investigate	M
138A	41.95	2.19%	15	0.024	3.31	3.31	3.15	2.25	1.17	N/A	Sufficient	N/A
139A	39.78	2.61%	18	0.024	11.72	10.85	8.97	2.50	4.00	0.87	Investigate	L
142	55.17	0.69%	24	0.024	14.51	14.51	4.62	3.00	2.73	N/A	Sufficient	N/A

Table 8
Culvert Analysis Results, 100-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Peak Flow Entering Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Pipe Bypass Flow (cfs)	Reported Condition Under Design Storm Flows	Investigation Priority
142A	24	2.54%	12	0.024	0.28	0.28	3.57	2.00	0.28	N/A	Sufficient	N/A
143	70.89	3.20%	12	0.024	95.17	2.56	5.95	2.00	2.53	92.61	Investigate	H
144	89.47	2.28%	12	0.024	9.14	4.27	6.57	2.00	4.09	4.87	Investigate	L
145	49.72	1.47%	24	0.024	69.49	22.22	9.55	3.00	3.83	47.27	Investigate	M
145A	19.71	3.30%	18	0.024	17.18	14.09	7.97	2.50	4.04	3.09	Investigate	L
149	72.68	2.93%	24	0.024	86.26	25.04	10.39	3.00	4.56	61.22	Investigate	H
170	53.99	0.85%	15	0.024	65.95	8.13	6.76	2.25	4.18	15.29	Investigate	M
172	38.92	0.57%	24	0.024	23.47	18.01	5.73	3.00	4.10	5.46	Investigate	L
177	59.99	3.53%	15	0.024	5.94	5.94	4.84	2.25	2.46	N/A	Investigate	H
178	55.19	1.92%	24	0.024	5.08	5.08	5.76	3.00	1.16	N/A	Sufficient	N/A
210	19.96	1.60%	8	0.015	9.09	2.29	6.66	1.67	1.94	6.80	Investigate	L
221	23.54	0.76%	12	0.024	89.78	4.47	5.83	2.00	3.46	85.31	Investigate	H
222	22.68	2.38%	12	0.024	0.08	0.08	0.27	2.00	1.14	N/A	Sufficient	N/A
223	34.08	1.61%	15	0.024	1.19	1.19	1.71	2.25	0.55	N/A	Sufficient	N/A
224	15.63	0.38%	15	0.024	1.08	1.08	3.70	2.25	0.65	N/A	Sufficient	N/A

Table 9

Storm Drain Pipe Analysis Results, 5-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows
4	65.26	7.57%	12	0.024	0.96	2.67	1.00	0.29	Sufficient
4A	164.11	2.30%	18	0.024	2.66	5.63	1.50	0.65	Sufficient
14	183.68	6.50%	12	0.024	0.87	5.78	1.00	0.31	Sufficient
18	38.46	3.90%	12	0.024	3.90	4.97	1.00	2.48	Investigate
18A	93.22	3.20%	12	0.024	3.91	5.33	1.00	2.22	Investigate
23A	150.99	7.34%	12	0.024	1.09	4.97	1.00	0.31	Sufficient
23B	113.77	5.24%	12	0.024	1.17	3.88	1.00	0.35	Sufficient
31	150.33	8.59%	12	0.024	0.82	4.80	1.00	0.26	Sufficient
32	125.5	1.23%	12	0.024	0.47	2.40	1.00	0.34	Sufficient
33	364.62	3.49%	36	0.015	24.19	11.23	3.00	1.00	Sufficient
34A	167.9	7.15%	24	0.015	6.33	6.48	2.00	0.57	Sufficient
34B	18.95	1.00%	24	0.015	3.54	4.56	2.00	0.69	Sufficient
34C	18.95	1.27%	24	0.015	2.98	4.50	2.00	0.65	Sufficient
35	274.08	3.87%	36	0.015	30.97	12.05	3.00	1.12	Sufficient
37	96.07	5.15%	36	0.015	31.84	13.20	3.00	1.22	Sufficient
38	581.39	4.72%	36	0.015	31.61	6.27	3.00	1.03	Sufficient
39A	124.89	7.02%	18	0.015	11.18	6.33	1.50	3.40	Investigate
39B	35.33	1.53%	18	0.015	4.54	2.57	1.50	3.24	Investigate
40	135.26	2.11%	24	0.015	10.32	7.49	2.00	0.91	Sufficient
41	44.91	0.89%	24	0.015	6.31	4.82	2.00	0.98	Sufficient
41A	75.59	4.26%	36	0.015	14.90	8.48	3.00	0.80	Sufficient
42	39.77	1.11%	24	0.015	2.68	3.29	2.00	0.58	Sufficient
43	122.19	2.59%	24	0.015	9.19	10.49	2.00	0.94	Sufficient
44	96.01	4.67%	36	0.015	2.31	5.74	3.00	0.28	Sufficient
51	161.52	0.25%	12	0.024	1.11	1.42	1.00	2.38	Investigate
52	69.42	0.62%	12	0.024	2.75	3.50	1.00	2.47	Investigate
53	65.85	1.50%	12	0.024	2.66	4.62	1.00	1.42	Investigate
56	108.89	0.58%	15	0.024	2.48	2.02	1.25	2.18	Investigate
57	59.84	1.12%	18	0.024	6.88	5.99	1.50	1.54	Investigate

Table 9
Storm Drain Pipe Analysis Results, 5-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows
58	77.08	-0.18%	15	0.024	2.43	1.98	1.25	2.20	Investigate
59	35.82	0.42%	18	0.024	2.43	1.42	1.50	1.84	Investigate
69	88.4	10.15%	21	0.024	1.76	1.20	1.75	0.30	Sufficient
69A	78.79	17.38%	10	0.024	2.25	5.23	0.83	0.39	Sufficient
69B	50.8	15.37%	21	0.024	26.92	11.39	1.75	1.90	Investigate
69C	21.58	61.08%	10	0.024	0.68	2.02	0.83	0.15	Sufficient
70	127.99	2.64%	30	0.024	30.49	10.10	2.50	3.69	Investigate
72	112.3	2.32%	24	0.024	3.73	6.06	2.00	0.68	Sufficient
72A	4.87	45.59%	24	0.024	3.31	5.45	2.00	0.31	Sufficient
74	161.71	3.63%	24	0.024	0.44	0.83	2.00	0.19	Sufficient
75	34.63	0.46%	24	0.024	0.31	2.10	2.00	0.18	Sufficient
76	259.2	0.91%	8	0.024	0.60	1.73	0.67	2.07	Investigate
77	149.76	0.83%	8	0.024	0.56	1.60	0.67	1.95	Investigate
78	452.83	0.77%	8	0.024	0.25	0.92	0.67	0.31	Sufficient
85A	11.69	4.96%	18	0.024	8.60	4.87	1.50	2.56	Investigate
85B	30.87	0.00%	18	0.024	8.25	4.67	1.50	2.67	Investigate
85C	33.47	1.40%	18	0.024	9.11	5.48	1.50	2.38	Investigate
88A	58.69	1.33%	18	0.024	0.00	0.00	1.50	0.00	Sufficient
88B	206.36	2.28%	18	0.024	4.07	3.59	1.50	0.73	Sufficient
88C	54.68	2.38%	18	0.024	7.09	4.01	1.50	1.94	Investigate
89	72.1	1.98%	15	0.024	6.99	5.70	1.25	3.15	Investigate
92	201.71	2.20%	18	0.015	0.85	1.49	1.50	0.25	Sufficient
93	46.06	1.35%	18	0.015	1.70	3.59	1.50	0.46	Sufficient
94	139.27	1.08%	18	0.015	1.99	4.04	1.50	0.48	Sufficient
95	59.59	1.90%	18	0.015	2.74	3.29	1.50	1.14	Sufficient
96	73.5	1.77%	18	0.024	0.14	1.69	1.50	0.15	Sufficient
96A	161.25	1.20%	18	0.024	5.14	5.51	1.50	1.94	Investigate
97	147.37	0.96%	18	0.024	5.86	3.45	1.50	1.71	Investigate
97A	34.21	0.99%	15	0.024	5.89	4.85	1.25	2.07	Investigate

Table 9
Storm Drain Pipe Analysis Results, 5-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows
98	62.87	0.76%	18	0.024	5.57	3.32	1.50	1.66	Investigate
110	113.18	1.80%	24	0.024	0.92	0.67	2.00	0.36	Sufficient
110A	20.06	7.83%	24	0.024	8.13	3.66	2.00	0.66	Sufficient
111	243.65	0.39%	24	0.024	8.74	3.55	2.00	2.04	Investigate
111A	201.67	0.73%	24	0.024	0.90	1.27	2.00	0.93	Sufficient
114	164.36	6.49%	48	0.024	24.73	11.03	4.00	1.02	Sufficient
115	101.78	1.57%	18	0.024	1.57	2.50	1.50	0.48	Sufficient
118	44.78	4.40%	12	0.024	3.98	5.06	1.00	2.09	Investigate
119	32.39	7.04%	12	0.024	4.22	9.15	1.00	2.83	Investigate
121	98.33	1.40%	36	0.024	14.64	6.39	3.00	1.79	Sufficient
121A	46.9	4.50%	18	0.024	10.40	5.91	1.50	0.82	Sufficient
122	65.65	6.82%	18	0.024	4.26	9.61	1.50	7.45	Investigate
123A	121.96	1.06%	8	0.024	0.87	2.50	0.67	2.90	Investigate
124	167.3	1.02%	8	0.024	0.89	2.95	0.67	1.92	Investigate
125	107.48	2.92%	8	0.024	0.47	1.58	0.67	0.47	Sufficient
126	199.27	0.86%	8	0.024	0.89	2.55	0.67	3.06	Investigate
127	248.24	1.49%	8	0.024	0.91	2.61	0.67	2.00	Investigate
128	29.7	1.45%	15	0.024	4.24	3.46	1.25	1.54	Investigate
129	79.13	0.10%	24	0.024	5.12	3.45	2.00	1.35	Sufficient
130	189.04	5.81%	24	0.024	5.11	3.25	2.00	0.56	Sufficient
131	55.82	5.14%	15	0.024	1.58	1.86	1.25	0.38	Sufficient
132	390.65	0.38%	24	0.024	6.74	2.66	2.00	1.53	Sufficient
133	688.94	0.62%	24	0.024	7.16	3.75	2.00	1.60	Sufficient
134	57.78	2.16%	18	0.024	6.78	6.36	1.50	1.16	Sufficient
135A	30.59	1.50%	21	0.024	1.67	2.73	1.75	0.59	Sufficient
136A	114.47	1.18%	15	0.024	1.84	3.18	1.25	0.66	Sufficient
137	38.74	1.21%	8	0.024	0.55	1.57	0.67	1.45	Investigate
138	38.53	0.16%	15	0.024	0.55	0.45	1.25	1.42	Investigate
139	293.77	0.09%	18	0.024	2.51	1.44	1.50	1.73	Investigate

Table 9

Storm Drain Pipe Analysis Results, 5-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows
140A	555.81	1.71%	24	0.024	7.69	4.15	2.00	1.47	Sufficient
141A	60.77	4.28%	18	0.024	0.00	0.00	1.50	2.56	Investigate
146	35.61	1.49%	12	0.024	0.22	1.77	1.00	0.21	Sufficient
147	34.87	6.51%	12	0.024	0.55	4.03	1.00	0.23	Sufficient
148	210.2	1.45%	12	0.015	1.44	5.54	1.00	0.68	Sufficient
148A	22.14	2.21%	12	0.015	1.04	2.55	1.00	0.35	Sufficient
150	293.84	1.63%	24	0.015	8.19	4.31	2.00	0.79	Sufficient
150A	39.24	0.87%	18	0.015	5.36	3.39	1.50	1.19	Sufficient
151	68.51	0.70%	24	0.015	11.59	4.72	2.00	1.57	Sufficient
151A	279.67	1.33%	24	0.015	16.23	7.04	2.00	1.36	Sufficient
152	45.89	3.70%	24	0.015	19.02	7.66	2.00	1.41	Sufficient
153	36.29	2.37%	15	0.015	0.46	0.59	1.25	0.94	Sufficient
153A	29.18	14.39%	15	0.015	2.25	2.87	1.25	0.28	Sufficient
153B	38.66	2.46%	15	0.015	2.04	1.99	1.25	1.80	Investigate
154	35.96	0.95%	30	0.015	16.55	3.37	2.50	3.74	Investigate
155	69.41	-0.59%	30	0.015	17.70	4.28	2.50	4.08	Investigate
156	58.13	0.71%	30	0.015	15.37	3.16	2.50	3.33	Investigate
157	253.95	0.85%	30	0.015	14.24	3.95	2.50	1.16	Sufficient
158	150.55	0.92%	30	0.015	3.56	2.94	2.50	0.54	Sufficient
158A	37.28	0.05%	15	0.015	2.08	2.85	1.25	0.87	Sufficient
159	37.01	8.54%	15	0.024	0.94	1.35	1.25	0.26	Sufficient
160A	170.72	1.00%	24	0.015	9.89	4.40	2.00	1.00	Sufficient
160B	90.16	0.22%	24	0.015	9.87	4.00	2.00	1.72	Sufficient
160C	70.99	1.06%	24	0.015	11.52	5.74	2.00	1.31	Sufficient
161	50.39	0.87%	24	0.015	10.00	5.71	2.00	1.26	Sufficient
162	36.18	10.31%	24	0.015	9.00	6.57	2.00	0.56	Sufficient
163	49.71	3.72%	18	0.015	3.41	6.21	1.50	0.49	Sufficient
164	36.58	2.38%	15	0.024	1.92	3.92	1.25	0.56	Sufficient
165	334.73	0.79%	24	0.024	3.16	3.35	2.00	0.81	Sufficient

Table 9

Storm Drain Pipe Analysis Results, 5-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows
166	86.64	2.27%	15	0.0240	0.57	1.12	1.25	0.28	Sufficient
167	36.25	0.88%	15	0.024	0.39	1.78	1.25	0.31	Sufficient
168	36.54	1.70%	15	0.024	1.55	3.23	1.25	0.54	Sufficient
169	40.5	2.40%	24	0.024	2.67	2.99	2.00	0.51	Sufficient
173	80.94	1.00%	15	0.024	2.88	2.66	1.25	0.93	Sufficient
174	36.34	2.89%	15	0.024	3.91	3.73	1.25	0.79	Sufficient
175	36.57	3.94%	15	0.024	2.94	3.65	1.25	0.57	Sufficient
175A	39.05	4.89%	18	0.024	2.84	2.29	1.50	0.48	Sufficient
176	64.05	1.48%	18	0.024	4.87	3.30	1.50	0.99	Sufficient
205	23.94	1.29%	12	0.015	2.27	5.72	1.00	1.75	Investigate
205B	15.95	0.06%	12	0.015	0.43	1.49	1.00	0.43	Sufficient
205C	27.71	0.79%	12	0.015	0.71	1.81	1.00	1.21	Investigate
205D	23.03	1.13%	12	0.015	1.41	2.61	1.00	1.41	Investigate
205E	27.65	0.83%	12	0.015	1.58	2.33	1.00	1.60	Investigate
205F	16.49	0.73%	12	0.015	0.53	2.10	1.00	0.36	Sufficient
205G	23.89	1.09%	12	0.015	0.66	2.87	1.00	0.35	Sufficient
205H	24.3	4.03%	12	0.015	1.04	5.29	1.00	0.32	Sufficient
206	118.49	2.20%	18	0.015	2.56	5.64	1.50	0.47	Sufficient
206A	27.38	0.77%	12	0.015	1.89	3.48	1.00	0.57	Sufficient
208A	48.52	1.57%	18	0.024	0.58	0.95	1.50	0.23	Sufficient
208B	14.39	0.90%	18	0.024	0.58	1.80	1.50	0.41	Sufficient
208C	11.09	5.32%	18	0.024	0.57	0.93	1.50	0.24	Sufficient

Table 10
Storm Drain Pipe Analysis Results, 100-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows	Investigation Priority
4	65.26	7.57%	12	0.024	2.08	3.68	1.00	0.44	Sufficient	N/A
4A	164.11	2.30%	18	0.024	4.91	6.33	4.70	0.92	Sufficient	N/A
14	183.68	6.50%	12	0.024	1.92	7.36	1.60	0.48	Sufficient	N/A
18	38.46	3.90%	12	0.024	3.98	5.06	1.00	1.11	Investigate	L
18A	93.22	3.20%	12	0.024	3.98	5.43	2.98	2.73	Sufficient	N/A
23A	150.99	7.34%	12	0.024	2.46	5.01	1.00	0.48	Sufficient	N/A
23B	113.77	5.24%	12	0.024	4.49	5.85	1.00	2.00	Investigate	H
31	150.33	8.59%	12	0.024	1.58	4.62	4.82	0.36	Sufficient	N/A
32	125.5	1.23%	12	0.024	0.91	2.86	1.60	0.49	Sufficient	N/A
33	364.62	3.49%	36	0.015	64.54	11.85	5.92	1.80	Sufficient	N/A
34A	167.9	7.15%	24	0.015	40.84	13.53	2.20	1.79	Sufficient	N/A
34B	18.95	1.00%	24	0.015	22.69	7.57	1.76	2.76	Investigate	H
34C	18.95	1.27%	24	0.015	16.89	5.84	1.95	2.18	Investigate	L
35	274.08	3.87%	36	0.015	103.25	14.61	12.95	6.93	Sufficient	N/A
37	96.07	5.15%	36	0.015	102.32	15.09	9.00	4.05	Sufficient	N/A
38	581.39	4.72%	36	0.015	101.69	14.94	12.94	2.53	Sufficient	N/A
39A	124.89	7.02%	18	0.015	12.19	6.90	2.95	3.95	Investigate	H
39B	35.33	1.53%	18	0.015	4.62	2.61	2.30	3.30	Investigate	H
40	135.26	2.11%	24	0.015	30.37	9.88	6.29	7.20	Investigate	M
41	44.91	0.89%	24	0.015	24.58	7.82	4.75	5.65	Investigate	M
41A	75.59	4.26%	36	0.015	34.50	9.59	5.16	1.37	Sufficient	N/A
42	39.77	1.11%	24	0.015	11.74	4.71	2.46	1.62	Sufficient	N/A
43	122.19	2.59%	24	0.015	20.71	11.77	3.74	1.63	Sufficient	N/A
44	96.01	4.67%	36	0.015	6.37	7.72	4.42	0.48	Sufficient	N/A
51	161.52	0.25%	12	0.024	0.82	1.05	1.38	2.38	Investigate	H
52	69.42	0.62%	12	0.024	2.68	3.42	1.78	2.47	Investigate	M
53	65.85	1.50%	12	0.024	2.69	4.62	1.39	1.42	Investigate	L
56	108.89	0.58%	15	0.024	2.61	2.13	1.25	2.25	Investigate	H
57	59.84	1.12%	18	0.024	6.81	6.00	0.54	1.54	Investigate	H

Table 10
Storm Drain Pipe Analysis Results, 100-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows	Investigation Priority
58	77.08	-0.18%	15	0.024	2.40	1.96	1.20	2.20	Investigate	H
59	35.82	0.42%	18	0.024	2.40	1.40	1.50	1.84	Investigate	L
69	88.4	10.15%	21	0.024	3.26	2.10	1.08	0.41	Sufficient	N/A
69A	78.79	17.38%	10	0.024	4.13	7.89	0.60	0.69	Investigate	L
69B	50.8	15.37%	21	0.024	26.91	11.38	0.90	1.90	Investigate	H
69C	21.58	61.08%	10	0.024	1.22	3.42	1.33	0.20	Sufficient	N/A
70	127.99	2.64%	30	0.024	42.18	13.45	14.00	8.48	Sufficient	N/A
72	112.3	2.32%	24	0.024	6.44	6.89	5.25	0.92	Sufficient	N/A
72A	4.87	45.59%	24	0.024	5.63	6.00	1.25	0.44	Sufficient	N/A
74	161.71	3.63%	24	0.024	0.80	0.88	2.66	0.25	Sufficient	N/A
75	34.63	0.46%	24	0.024	0.59	2.49	2.86	0.26	Sufficient	N/A
76	259.2	0.91%	8	0.024	0.59	1.68	1.07	2.07	Investigate	H
77	149.76	0.83%	8	0.024	0.56	1.62	0.95	1.95	Investigate	H
78	452.83	0.77%	8	0.024	0.44	1.41	1.25	0.44	Sufficient	N/A
85A	11.69	4.96%	18	0.024	9.17	5.19	1.50	2.84	Investigate	H
85B	30.87	0.00%	18	0.024	8.46	4.79	1.70	2.70	Investigate	H
85C	33.47	1.40%	18	0.024	9.88	5.83	1.97	2.97	Investigate	H
88A	58.69	1.33%	18	0.024	0.08	0.16	1.50	0.29	Sufficient	N/A
88B	206.36	2.28%	18	0.024	5.76	3.68	2.40	1.07	Sufficient	N/A
88C	54.68	2.38%	18	0.024	10.40	5.88	4.00	3.69	Sufficient	N/A
89	72.1	1.98%	15	0.024	6.81	5.55	2.15	3.15	Investigate	H
92	201.71	2.20%	18	0.015	1.78	1.77	1.26	0.37	Sufficient	N/A
93	46.06	1.35%	18	0.015	3.11	4.23	3.97	0.73	Sufficient	N/A
94	139.27	1.08%	18	0.015	3.67	4.19	3.68	1.34	Sufficient	N/A
95	59.59	1.90%	18	0.015	5.48	3.10	1.80	2.80	Investigate	H
96	73.5	1.77%	18	0.024	0.14	1.69	1.59	0.15	Sufficient	N/A
96A	161.25	1.20%	18	0.024	5.14	5.51	0.94	1.94	Investigate	H
97	147.37	0.96%	18	0.024	5.88	3.43	1.60	2.02	Investigate	L
97A	34.21	0.99%	15	0.024	5.92	4.91	1.07	2.07	Investigate	H

Table 10

Storm Drain Pipe Analysis Results, 100-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows	Investigation Priority
98	62.87	0.76%	18	0.024	5.58	3.23	2.70	1.81	Sufficient	N/A
110	113.18	1.80%	24	0.024	1.51	0.77	4.56	3.54	Sufficient	N/A
110A	20.06	7.83%	24	0.024	14.43	4.59	3.47	4.47	Investigate	H
111	243.65	0.39%	24	0.024	14.16	4.51	6.54	5.56	Sufficient	N/A
111A	201.67	0.73%	24	0.024	1.55	1.49	4.78	3.35	Sufficient	N/A
114	164.36	6.49%	48	0.024	44.26	12.81	10.35	1.40	Sufficient	N/A
115	101.78	1.57%	18	0.024	2.87	2.35	4.00	0.87	Sufficient	N/A
118	44.78	4.40%	12	0.024	5.74	7.31	4.93	5.93	Investigate	H
119	32.39	7.04%	12	0.024	7.04	11.05	4.65	5.65	Investigate	H
121	98.33	1.40%	36	0.024	19.57	7.26	2.48	3.48	Investigate	H
121A	46.9	4.50%	18	0.024	23.06	7.39	1.50	1.32	Sufficient	N/A
122	65.65	6.82%	18	0.024	0.14	0.22	4.30	7.34	Investigate	H
123A	121.96	1.06%	8	0.024	0.87	2.50	1.90	2.90	Investigate	H
124	167.3	1.02%	8	0.024	0.93	2.95	0.92	1.92	Investigate	H
125	107.48	2.92%	8	0.024	0.55	1.59	0.70	0.65	Sufficient	N/A
126	199.27	0.86%	8	0.024	0.89	2.54	2.06	3.06	Investigate	H
127	248.24	1.49%	8	0.024	0.91	2.61	1.00	2.00	Investigate	H
128	29.7	1.45%	15	0.024	4.96	4.04	1.39	2.38	Investigate	M
129	79.13	0.10%	24	0.024	6.19	3.67	1.83	1.49	Sufficient	N/A
130	189.04	5.81%	24	0.024	6.19	3.29	3.35	0.62	Sufficient	N/A
131	55.82	5.14%	15	0.024	5.26	4.29	2.20	3.18	Investigate	M
132	390.65	0.38%	24	0.024	11.15	3.55	4.20	5.20	Investigate	H
133	688.94	0.62%	24	0.024	11.14	4.45	5.00	6.00	Investigate	H
134	57.78	2.16%	18	0.024	9.57	6.85	1.15	2.15	Investigate	H
135A	30.59	1.50%	21	0.024	3.08	3.11	5.00	0.94	Sufficient	N/A
136A	114.47	1.18%	15	0.024	3.37	3.63	5.60	1.03	Sufficient	N/A
137	38.74	1.21%	8	0.024	0.88	2.53	0.90	2.57	Investigate	H
138	38.53	0.16%	15	0.024	0.89	0.73	1.12	2.09	Investigate	M
139	293.77	0.09%	18	0.024	3.41	1.93	0.67	2.98	Investigate	H

Table 10
Storm Drain Pipe Analysis Results, 100-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows	Investigation Priority
140A	555.81	1.71%	24	0.024	11.70	3.88	0.63	2.00	Investigate	H
141A	60.77	4.28%	18	0.024	0.00	0.08	1.53	2.58	Investigate	H
146	35.61	1.49%	12	0.024	0.38	2.02	1.35	0.27	Sufficient	N/A
147	34.87	6.51%	12	0.024	0.96	4.70	1.50	0.31	Sufficient	N/A
148	210.2	1.45%	12	0.015	2.32	5.82	1.55	1.97	Investigate	L
148A	22.14	2.21%	12	0.015	1.90	2.70	1.10	1.62	Investigate	M
150	293.84	1.63%	24	0.015	16.91	5.81	4.60	2.56	Sufficient	N/A
150A	39.24	0.87%	18	0.015	11.27	4.28	3.60	2.47	Sufficient	N/A
151	68.51	0.70%	24	0.015	17.08	5.44	5.95	4.97	Sufficient	N/A
151A	279.67	1.33%	24	0.015	22.85	7.27	6.90	4.67	Sufficient	N/A
152	45.89	3.70%	24	0.015	28.88	9.19	5.75	3.77	Sufficient	N/A
153	36.29	2.37%	15	0.015	7.29	5.94	4.93	5.77	Investigate	M
153A	29.18	14.39%	15	0.015	5.22	5.37	5.70	5.71	Investigate	L
153B	38.66	2.46%	15	0.015	4.92	4.01	1.72	1.59	Sufficient	N/A
154	35.96	0.95%	30	0.015	32.69	6.66	7.43	4.88	Sufficient	N/A
155	69.41	-0.59%	30	0.015	35.41	7.49	7.90	4.94	Sufficient	N/A
156	58.13	0.71%	30	0.015	29.71	6.05	7.55	5.42	Sufficient	N/A
157	253.95	0.85%	30	0.015	27.93	5.69	7.27	6.37	Sufficient	N/A
158	150.55	0.92%	30	0.015	7.47	3.46	4.18	5.14	Investigate	M
158A	37.28	0.05%	15	0.015	4.01	3.38	4.24	4.17	Sufficient	N/A
159	37.01	8.54%	15	0.024	4.16	3.39	4.53	3.08	Sufficient	N/A
160A	170.72	1.00%	24	0.015	17.47	5.56	8.55	7.78	Sufficient	N/A
160B	90.16	0.22%	24	0.015	17.51	5.57	9.23	8.60	Sufficient	N/A
160C	70.99	1.06%	24	0.015	22.87	7.28	7.53	5.97	Sufficient	N/A
161	50.39	0.87%	24	0.015	22.09	7.06	6.95	7.40	Investigate	L
162	36.18	10.31%	24	0.015	19.61	7.38	3.30	4.20	Investigate	M
163	49.71	3.72%	18	0.015	7.87	6.86	1.48	2.48	Investigate	H
164	36.58	2.38%	15	0.024	4.35	4.58	1.03	2.03	Investigate	H
165	334.73	0.79%	24	0.024	5.84	3.50	4.75	1.90	Sufficient	N/A

Table 10

Storm Drain Pipe Analysis Results, 100-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Reported Condition Under Design Storm Flows	Investigation Priority
166	86.64	2.27%	15	0.024	1.14	1.56	2.14	0.39	Sufficient	N/A
167	36.25	0.88%	15	0.024	0.79	2.17	1.74	0.45	Sufficient	N/A
168	36.54	1.70%	15	0.024	2.82	3.82	2.50	0.80	Sufficient	N/A
169	40.5	2.40%	24	0.024	4.65	3.55	3.10	0.96	Sufficient	N/A
173	80.94	1.00%	15	0.024	6.22	5.07	3.00	4.00	Investigate	H
174	36.34	2.89%	15	0.024	8.11	6.61	2.45	3.45	Investigate	H
175	36.57	3.94%	15	0.024	6.11	4.98	4.00	5.00	Investigate	H
175A	39.05	4.89%	18	0.024	8.91	5.18	3.95	3.13	Sufficient	N/A
176	64.05	1.48%	18	0.024	9.92	5.61	5.50	5.45	Sufficient	N/A
205	23.94	1.29%	12	0.015	3.54	5.99	0.75	1.69	Investigate	M
205B	15.95	0.06%	12	0.015	0.85	1.72	1.83	0.64	Sufficient	N/A
205C	27.71	0.79%	12	0.015	1.36	1.90	1.30	1.04	Sufficient	N/A
205D	23.03	1.13%	12	0.015	2.38	3.03	1.45	1.26	Sufficient	N/A
205E	27.65	0.83%	12	0.015	2.38	3.03	0.75	1.49	Investigate	M
205F	16.49	0.73%	12	0.015	1.03	2.33	1.90	0.56	Sufficient	N/A
205G	23.89	1.09%	12	0.015	1.30	3.28	1.00	0.54	Sufficient	N/A
205H	24.3	4.03%	12	0.015	2.09	6.16	1.15	0.49	Sufficient	N/A
206	118.49	2.20%	18	0.015	5.33	6.76	1.40	0.71	Sufficient	N/A
206A	27.38	0.77%	12	0.015	4.18	4.21	1.10	0.92	Sufficient	N/A
208A	48.52	1.57%	18	0.024	1.30	1.52	1.50	0.36	Sufficient	N/A
208B	14.39	0.90%	18	0.024	1.31	2.44	1.45	0.60	Sufficient	N/A
208C	11.09	5.32%	18	0.024	1.29	1.49	1.60	0.37	Sufficient	N/A

Table 11
Storm Drain Inlet Analysis Results, 5-Year Storm

Inlet No.	Inlet Location	# Of Inlet Openings	Inlet Invert Elevation (ft)	Inlet Grate Elevation (ft)	Grate Clogging Factor (%)	Peak Flow to Inlet (cfs)	Peak Flow Intercepted By Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency During Peak Flow (%)	Max Gutter Spread During Peak Flow (ft)	Max Gutter Water Depth During Peak Flow (ft)	Reported Condition Under Design Storm Flows
1	In Sag	3	7010.21	7013.51	20.00	5.88	N/A	N/A	N/A	11.42	0.42	Sufficient
2	In Sag	3	7009.67	7013.62	20.00	8.64	N/A	N/A	N/A	13.49	0.52	Investigate
3	On Grade	1	7056.09	7058.85	20.00	4.94	3.36	1.28	72.36	10.01	0.28	Sufficient
4	On Grade	1	7056.14	7059.09	20.00	3.22	2.59	0.62	80.61	8.74	0.26	Sufficient
5	On Grade	2	7059.87	7065.62	20.00	7.45	5.83	1.62	78.30	11.86	0.32	Sufficient
6	On Grade	1	7043.90	7057.85	20.00	1.44	1.06	0.38	73.90	6.81	0.22	Sufficient
7	On Grade	2	7059.47	7066.76	20.00	6.68	5.34	1.34	79.97	10.51	0.29	Sufficient
8	On Grade	2	7125.75	7129.21	20.00	2.80	2.70	0.09	96.68	6.24	0.21	Sufficient
9	On Grade	2	7125.31	7130.05	20.00	9.80	6.99	2.81	71.33	10.87	0.30	Sufficient
10	In Sag	1	7126.62	7132.04	20.00	2.31	N/A	N/A	N/A	9.00	0.43	Sufficient
11	In Sag	1	7097.40	7100.38	20.00	0.88	N/A	N/A	N/A	1.49	0.25	Sufficient
12	On Grade	1	7047.46	7053.16	20.00	2.84	1.72	1.11	60.80	9.98	0.28	Sufficient
13	In Sag	1	7048.46	7051.06	20.00	0.48	N/A	N/A	N/A	1.32	0.15	Sufficient
14	In Sag	1	7046.92	7052.74	20.00	0.36	N/A	N/A	N/A	0.99	0.11	Sufficient
15	In Sag	1	7011.74	7014.22	20.00	3.95	N/A	N/A	N/A	13.20	0.51	Investigate
15A	In Sag	1	7005.57	7011.50	20.00	3.54	N/A	N/A	N/A	11.94	0.49	Sufficient
16	In Sag	1	7008.41	7010.41	20.00	1.09	N/A	N/A	N/A	3.40	0.32	Sufficient
16A	In Sag	1	7003.60	7009.25	20.00	0.70	N/A	N/A	N/A	1.93	0.16	Sufficient
17	In Sag	1	6950.16	6955.68	20.00	0.92	N/A	N/A	N/A	2.55	0.28	Sufficient
17A	In Sag	1	6949.65	6954.12	20.00	9.11	N/A	N/A	N/A	25.14	0.71	Investigate
17B	In Sag	1	6948.08	6955.62	20.00	0.00	N/A	N/A	N/A	0.00	0.00	Sufficient
18	In Sag	1	6947.12	6952.90	20.00	1.47	N/A	N/A	N/A	4.68	0.34	Sufficient
18A	On Grade	1	7013.00	7018.00	20.00	1.70	1.58	0.12	93.15	7.16	0.23	Sufficient
19	In Sag	1	6919.71	6923.19	20.00	14.73	N/A	N/A	N/A	29.68	0.84	Investigate
20	In Sag	1	6918.33	6929.68	20.00	0.34	N/A	N/A	N/A	1.59	0.12	Sufficient
21	On Grade	1	6922.81	6928.11	20.00	9.45	5.19	4.26	54.95	16.33	0.41	Investigate
22	In Sag	1	6923.80	6925.40	20.00	2.26	N/A	N/A	N/A	4.39	0.34	Sufficient
23	On Grade	1	6910.11	6925.11	20.00	0.24	0.23	0.01	95.48	1.76	0.08	Sufficient
24	In Sag	1	6923.29	6925.62	20.00	0.68	N/A	N/A	N/A	0.37	0.18	Sufficient
25	In Sag	1	6919.08	6921.16	20.00	1.77	N/A	N/A	N/A	2.90	0.31	Sufficient
26	On Grade	1	6903.33	6909.58	20.00	0.43	0.42	0.00	98.98	3.76	0.15	Sufficient
27	In Sag	1	6917.92	6919.82	20.00	68.47	N/A	N/A	N/A	187.87	3.55	Investigate
28	In Sag	1	6905.55	6907.80	20.00	3.57	N/A	N/A	N/A	30.79	0.53	Investigate
29	In Sag	1	6902.07	6904.02	20.00	5.39	N/A	N/A	N/A	19.87	0.54	Investigate
30	In Sag	1	6900.82	6902.89	20.00	1.39	N/A	N/A	N/A	4.79	0.34	Sufficient
31	In Sag	1	6898.47	6901.37	20.00	2.25	N/A	N/A	N/A	8.75	0.41	Sufficient
32	In Sag	1	6897.18	6899.10	20.00	1.47	N/A	N/A	N/A	5.19	0.34	Sufficient

Table 11

Storm Drain Inlet Analysis Results, 5-Year Storm

Inlet No.	Inlet Location	# Of Inlet Openings	Inlet Invert Elevation (ft)	Inlet Grate Elevation (ft)	Grate Clogging Factor (%)	Peak Flow to Inlet (cfs)	Peak Flow Intercepted By Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency During Peak Flow (%)	Max Gutter Spread During Peak Flow (ft)	Max Gutter Water Depth During Peak Flow (ft)	Reported Condition Under Design Storm Flows
33	In Sag	1	6895.48	6897.18	20.00	1.48	N/A	N/A	N/A	5.25	0.33	Sufficient
34	In Sag	1	6892.34	6895.40	20.00	2.66	N/A	N/A	N/A	10.41	0.46	Sufficient
35	On Grade	1	6897.56	6901.42	20.00	0.31	0.31	0.00	100.00	1.15	0.07	Sufficient
36	On Grade	1	6897.40	6901.06	20.00	0.13	0.13	0.00	100.00	0.48	0.03	Sufficient
37	In Sag	1	6969.00	6971.47	20.00	14.04	N/A	N/A	N/A	61.38	0.99	Investigate
38	On Grade	1	6969.40	6971.78	20.00	6.94	3.21	3.72	46.33	13.50	0.35	Investigate
39	In Sag	1	6968.57	6970.96	20.00	0.00	N/A	N/A	N/A	0.00	0.00	Sufficient
40	In Sag	1	6962.16	6964.36	20.00	1.75	N/A	N/A	N/A	7.81	0.41	Sufficient
41	On Grade	1	6970.88	6974.28	20.00	10.47	4.10	6.37	39.18	17.00	0.42	Investigate
42	On Grade	1	6966.18	6971.18	20.00	6.36	2.97	3.39	46.66	13.94	0.36	Investigate
45	On Grade	1	7011.02	7013.82	20.00	0.78	0.78	0.00	100.00	2.93	0.14	Sufficient
46	In Sag	1	7012.53	7017.21	20.00	0.30	N/A	N/A	N/A	0.83	0.09	Sufficient
47	On Grade	1	7013.15	7018.12	20.00	1.84	1.70	0.14	92.53	6.69	0.22	Sufficient
48	On Grade	1	7016.40	7018.66	20.00	0.86	0.86	0.00	99.94	3.86	0.16	Sufficient
49	In Sag	1	6993.04	6995.11	20.00	6.71	N/A	N/A	N/A	19.50	0.64	Investigate
50	On Grade	1	6875.16	6878.20	20.00	4.37	1.91	2.46	43.80	13.42	0.35	Investigate
51	In Sag	1	6992.70	6995.04	20.00	0.96	N/A	N/A	N/A	2.66	0.29	Sufficient
52	In Sag	1	6875.63	6878.20	20.00	0.67	N/A	N/A	N/A	1.85	0.16	Sufficient
53	In Sag	1	6990.88	6992.83	20.00	6.65	N/A	N/A	N/A	18.30	0.57	Investigate
54	In Sag	1	6988.96	6991.55	20.00	0.00	N/A	N/A	N/A	0.00	0.00	Sufficient
55	In Sag	1	6914.92	6921.87	20.00	0.80	N/A	N/A	N/A	2.22	0.24	Sufficient
56	In Sag	1	6873.64	6875.97	20.00	1.57	N/A	N/A	N/A	6.50	0.30	Sufficient
57	In Sag	1	6874.89	6877.04	20.00	18.35	N/A	N/A	N/A	824.51	2.32	Investigate
58	In Sag	1	6966.99	6970.14	20.00	7.93	N/A	N/A	N/A	22.44	0.70	Investigate
60	In Sag	1	6890.63	6892.95	20.00	2.69	N/A	N/A	N/A	10.53	0.44	Sufficient
61	On Grade	1	6890.40	6893.00	20.00	0.98	0.98	0.00	99.86	4.59	0.18	Sufficient
62	In Sag	1	6882.27	6885.47	20.00	1.66	N/A	N/A	N/A	6.91	0.38	Sufficient
63	On Grade	1	6890.58	6893.28	20.00	0.29	0.29	0.00	100.00	1.64	0.08	Sufficient
64	In Sag	2	6922.18	6924.53	20.00	0.22	N/A	N/A	N/A	0.32	0.06	Sufficient
65	In Sag	1	6894.32	6896.32	20.00	33.56	N/A	N/A	N/A	689.35	2.15	Investigate
66	In Sag	1	6890.80	6892.87	20.00	0.86	N/A	N/A	N/A	2.37	0.26	Sufficient
67	On Grade	1	6879.27	6884.60	20.00	0.33	0.33	0.00	100.00	2.31	0.10	Sufficient
68	On Grade	1	6877.93	6883.93	20.00	1.02	1.01	0.01	99.42	5.51	0.19	Sufficient
69	On Grade	1	6886.73	6893.33	20.00	2.99	2.44	0.55	81.64	9.26	0.27	Sufficient
70	In Sag	1	6874.95	6876.95	20.00	0.63	N/A	N/A	N/A	2.16	0.17	Sufficient
71	On Grade	1	6874.89	6876.52	20.00	6.47	4.13	2.34	63.82	12.92	0.34	Investigate
72	On Grade	1	6887.19	6893.19	20.00	0.83	0.83	0.00	99.72	4.81	0.18	Sufficient

Table 11

Storm Drain Inlet Analysis Results, 5-Year Storm

Inlet No.	Inlet Location	# Of Inlet Openings	Inlet Invert Elevation (ft)	Inlet Grate Elevation (ft)	Grate Clogging Factor (%)	Peak Flow to Inlet (cfs)	Peak Flow Intercepted By Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency During Peak Flow (%)	Max Gutter Spread During Peak Flow (ft)	Max Gutter Water Depth During Peak Flow (ft)	Reported Condition Under Design Storm Flows
73	In Sag	1	6912.31	6914.61	20.00	0.59	N/A	N/A	N/A	1.63	0.18	Sufficient
74	In Sag	1	6913.30	6915.40	20.00	1.92	N/A	N/A	N/A	6.54	0.38	Sufficient
75	On Grade	1	6912.71	6915.61	20.00	0.44	0.44	0.00	100.00	2.01	0.11	Sufficient
76	On Grade	2	6913.09	6915.49	20.00	0.71	0.71	0.00	100.00	3.70	0.16	Sufficient
77	In Sag	1	6912.77	6915.67	20.00	0.09	N/A	N/A	N/A	0.26	0.03	Sufficient
78	In Sag	1	6912.65	6914.65	20.00	0.13	N/A	N/A	N/A	0.37	0.04	Sufficient
79	In Sag	1	6912.09	6914.54	20.00	0.56	N/A	N/A	N/A	1.54	0.15	Sufficient
80	In Sag	1	6919.70	6924.30	20.00	1.48	N/A	N/A	N/A	4.75	0.35	Sufficient
81	In Sag	1	6907.33	6909.78	20.00	0.58	N/A	N/A	N/A	1.61	0.18	Sufficient
82	In Sag	1	6911.83	6913.58	20.00	0.00	N/A	N/A	N/A	0.00	0.00	Sufficient
83	In Sag	1	6907.23	6909.83	20.00	0.11	N/A	N/A	N/A	0.31	0.03	Sufficient
84	In Sag	1	6911.60	6913.35	20.00	0.59	N/A	N/A	N/A	1.64	0.18	Sufficient
85	On Grade	1	6912.39	6914.54	20.00	0.39	0.39	0.00	100.00	1.78	0.10	Sufficient
86	In Sag	1	6910.71	6917.46	20.00	0.86	N/A	N/A	N/A	2.37	0.21	Sufficient
87	In Sag	1	6914.91	6917.63	20.00	2.44	N/A	N/A	N/A	8.38	0.40	Sufficient
88	In Sag	1	6910.66	6916.59	20.00	3.68	N/A	N/A	N/A	12.37	0.50	Investigate
89	In Sag	1	6909.80	6916.50	20.00	1.99	N/A	N/A	N/A	6.83	0.39	Sufficient
90	In Sag	1	6916.83	6921.83	20.00	2.95	N/A	N/A	N/A	10.12	0.45	Sufficient
91	In Sag	1	6915.39	6921.89	20.00	1.97	N/A	N/A	N/A	6.72	0.39	Sufficient
92	In Sag	1	6916.83	6921.78	20.00	3.14	N/A	N/A	N/A	10.71	0.46	Sufficient
93	In Sag	1	6920.75	6924.20	20.00	3.92	N/A	N/A	N/A	13.12	0.51	Investigate
94	In Sag	1	6920.17	6924.17	20.00	2.91	N/A	N/A	N/A	9.99	0.45	Sufficient
95	On Grade	1	6935.64	6939.14	20.00	1.67	1.56	0.11	93.45	7.16	0.23	Sufficient
96	On Grade	1	6936.02	6939.16	20.00	0.19	0.19	0.00	100.00	1.63	0.06	Sufficient
96A	On Grade	1	6936.34	6939.08	20.00	0.39	0.39	0.00	100.00	3.46	0.14	Sufficient
97	On Grade	1	6935.02	6939.12	20.00	1.15	1.13	0.02	97.99	5.93	0.20	Sufficient
98	In Sag	1	6933.24	6935.72	20.00	1.58	N/A	N/A	N/A	5.14	0.35	Sufficient
99	In Sag	1	6931.39	6935.69	20.00	2.84	N/A	N/A	N/A	9.73	0.44	Sufficient
100	In Sag	1	6934.11	6936.14	20.00	1.93	N/A	N/A	N/A	6.56	0.38	Sufficient
101	In Sag	1	6928.47	6934.00	20.00	1.37	N/A	N/A	N/A	4.27	0.29	Sufficient
102	In Sag	1	6927.66	6935.61	20.00	1.48	N/A	N/A	N/A	4.74	0.33	Sufficient
103	In Sag	1	6925.31	6933.84	20.00	1.02	N/A	N/A	N/A	2.83	0.27	Sufficient
104	On Grade	1	6925.94	6931.18	20.00	2.41	2.09	0.32	86.84	7.98	0.24	Sufficient
105	On Grade	1	6925.92	6931.12	20.00	1.53	1.46	0.07	95.43	6.42	0.21	Sufficient
106	In Sag	1	6922.39	6930.94	20.00	1.31	N/A	N/A	N/A	4.04	0.32	Sufficient
107	In Sag	1	6921.98	6930.41	20.00	1.63	N/A	N/A	N/A	5.33	0.36	Sufficient
108	In Sag	1	6921.64	6930.54	20.00	1.56	N/A	N/A	N/A	5.04	0.35	Sufficient

Table 11
Storm Drain Inlet Analysis Results, 5-Year Storm

Inlet No.	Inlet Location	# Of Inlet Openings	Inlet Invert Elevation (ft)	Inlet Grate Elevation (ft)	Grate Clogging Factor (%)	Peak Flow to Inlet (cfs)	Peak Flow Intercepted By Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency During Peak Flow (%)	Max Gutter Spread During Peak Flow (ft)	Max Gutter Water Depth During Peak Flow (ft)	Reported Condition Under Design Storm Flows
110	In Sag	1	6948.32	6951.02	20.00	4.14	N/A	N/A	N/A	13.26	0.52	Investigate
111	In Sag	2	6948.20	6950.82	20.00	2.03	N/A	N/A	N/A	4.84	0.35	Sufficient
112	On Grade	1	6962.40	6964.36	20.00	15.35	7.16	8.18	46.68	19.74	0.48	Investigate
113	In Sag	1	7033.29	7043.29	20.00	1.21	N/A	N/A	N/A	3.09	0.29	Sufficient
114	In Sag	1	6922.94	6925.04	20.00	1.04	N/A	N/A	N/A	2.95	0.31	Sufficient
115	In Sag	1	6922.45	6925.00	20.00	0.42	N/A	N/A	N/A	1.17	0.13	Sufficient
117	On Grade	1	6896.26	6898.79	20.00	0.48	0.48	0.00	100.00	3.99	0.16	Sufficient
118	In Sag	1	6997.33	6999.33	20.00	0.35	N/A	N/A	N/A	1.03	0.11	Sufficient
119	In Sag	1	7031.80	7040.87	20.00	0.12	N/A	N/A	N/A	0.36	0.04	Sufficient
120	On Grade	1	6921.65	6924.15	20.00	0.33	0.33	0.00	100.00	2.29	0.10	Sufficient
121	In Sag	4	7056.62	7066.00	20.00	15.65	N/A	N/A	N/A	8.09	0.54	Investigate

Note: "Peak Flow intercepted by Inlet (cfs)", "Peak Flow Bypassing Inlet (cfs)", and "Inlet Efficiency During Peak Flow (%)" are all shown as "N/A" for inlets located in sag condition.
Model assumes 100% capture of flows regardless of water depth and spread.

Table 12
Storm Drain Inlet Analysis Results, 100-Year Storm

Inlet No.	Inlet Location	# Of Inlet Openings	Inlet Invert Elevation (ft)	Inlet Grate Elevation (ft)	Grate Clogging Factor (%)	Peak Flow to Inlet (cfs)	Peak Flow Intercepted By Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency During Peak Flow (%)	Max Gutter Spread During Peak Flow (ft)	Max Gutter Water Depth During Peak Flow (ft)	Reported Condition Under Design Storm Flows	Investigation Priority
1	In Sag	3	7010.21	7013.51	20.00	15.17	N/A	N/A	N/A	14.74	0.55	Investigate	L
2	In Sag	3	7009.67	7013.62	20.00	62.08	N/A	N/A	N/A	38.58	0.82	Investigate	M
3	On Grade	1	7056.09	7058.85	20.00	66.33	17.64	48.69	26.60	29.02	0.66	Investigate	L
4	On Grade	1	7056.14	7059.09	20.00	40.90	13.02	27.88	31.84	24.39	0.57	Investigate	L
5	On Grade	2	7059.87	7065.62	20.00	44.67	19.12	25.55	42.80	24.05	0.57	Investigate	L
6	On Grade	1	7043.90	7057.85	20.00	2.87	1.70	1.17	59.09	9.38	0.27	Sufficient	N/A
7	On Grade	2	7059.47	7066.76	20.00	11.26	7.70	3.56	68.39	13.04	0.34	Sufficient	N/A
8	On Grade	2	7125.75	7129.21	20.00	21.70	11.76	9.94	54.19	15.27	0.39	Sufficient	N/A
9	On Grade	2	7125.31	7130.05	20.00	19.01	10.81	8.19	56.89	14.26	0.37	Sufficient	N/A
10	In Sag	1	7126.62	7132.04	20.00	6.38	N/A	N/A	N/A	22.90	0.71	Investigate	L
11	In Sag	1	7097.40	7100.38	20.00	1.93	N/A	N/A	N/A	5.53	0.36	Sufficient	N/A
12	On Grade	1	7047.46	7053.16	20.00	6.02	2.86	3.16	47.55	13.64	0.36	Sufficient	N/A
13	In Sag	1	7048.46	7051.06	20.00	0.92	N/A	N/A	N/A	2.54	0.28	Sufficient	N/A
14	In Sag	1	7046.92	7052.74	20.00	0.68	N/A	N/A	N/A	1.88	0.21	Sufficient	N/A
15	In Sag	1	7011.74	7014.22	20.00	9.98	N/A	N/A	N/A	18.14	0.61	Investigate	L
15A	In Sag	1	7005.57	7011.50	20.00	8.12	N/A	N/A	N/A	16.08	0.57	Investigate	L
16	In Sag	1	7008.41	7010.41	20.00	2.48	N/A	N/A	N/A	9.70	0.44	Sufficient	N/A
16A	In Sag	1	7003.60	7009.25	20.00	2.20	N/A	N/A	N/A	7.56	0.36	Sufficient	N/A
17	In Sag	1	6950.16	6955.68	20.00	1.56	N/A	N/A	N/A	5.07	0.35	Sufficient	N/A
17A	In Sag	1	6949.65	6954.12	20.00	16.39	N/A	N/A	N/A	39.72	0.98	Investigate	M
17B	In Sag	1	6948.08	6955.62	20.00	0.00	N/A	N/A	N/A	0.00	0.00	Sufficient	N/A
18	In Sag	1	6947.12	6952.90	20.00	2.51	N/A	N/A	N/A	8.63	0.42	Sufficient	N/A
18A	On Grade	1	7013.00	7018.00	20.00	3.79	2.88	0.91	76.08	10.28	0.29	Sufficient	N/A
19	In Sag	1	6919.71	6923.19	20.00	22.28	N/A	N/A	N/A	40.79	1.06	Investigate	H
20	In Sag	1	6918.33	6929.68	20.00	0.59	N/A	N/A	N/A	2.81	0.20	Sufficient	N/A
21	On Grade	1	6922.81	6928.11	20.00	1.33	1.19	0.14	89.78	7.07	0.23	Sufficient	N/A
22	In Sag	1	6923.80	6925.40	20.00	4.14	N/A	N/A	N/A	9.26	0.44	Sufficient	N/A
23	On Grade	1	6910.11	6925.11	20.00	0.49	0.46	0.02	95.48	3.60	0.15	Sufficient	N/A
24	In Sag	1	6923.29	6925.62	20.00	1.22	N/A	N/A	N/A	1.30	0.28	Sufficient	N/A
25	In Sag	1	6919.08	6921.16	20.00	3.27	N/A	N/A	N/A	7.13	0.39	Sufficient	N/A
26	On Grade	1	6903.33	6909.58	20.00	0.86	0.81	0.05	93.98	5.90	0.20	Sufficient	N/A
27	In Sag	1	6917.92	6919.82	20.00	118.68	N/A	N/A	N/A	559.72	8.31	Investigate	H
28	In Sag	1	6905.55	6907.80	20.00	6.07	N/A	N/A	N/A	51.85	0.70	Investigate	L
29	In Sag	1	6902.07	6904.02	20.00	10.59	N/A	N/A	N/A	34.22	0.81	Investigate	M
30	In Sag	1	6900.82	6902.89	20.00	2.76	N/A	N/A	N/A	10.78	0.46	Sufficient	N/A
31	In Sag	1	6898.47	6901.37	20.00	4.78	N/A	N/A	N/A	17.96	0.59	Investigate	L
32	In Sag	1	6897.18	6899.10	20.00	3.05	N/A	N/A	N/A	11.96	0.48	Sufficient	N/A
33	In Sag	1	6895.48	6897.18	20.00	3.09	N/A	N/A	N/A	12.09	0.47	Sufficient	N/A
34	In Sag	1	6892.34	6895.40	20.00	5.57	N/A	N/A	N/A	20.43	0.65	Investigate	L
35	On Grade	1	6897.56	6901.42	20.00	0.59	0.59	0.00	100.00	2.08	0.12	Sufficient	N/A
36	On Grade	1	6897.40	6901.06	20.00	0.22	0.22	0.00	100.00	0.81	0.05	Sufficient	N/A
37	In Sag	1	6969.00	6971.47	20.00	22.55	N/A	N/A	N/A	166.75	1.52	Investigate	H

Table 12
Storm Drain Inlet Analysis Results, 100-Year Storm

Inlet No.	Inlet Location	# Of Inlet Openings	Inlet Invert Elevation (ft)	Inlet Grate Elevation (ft)	Grate Clogging Factor (%)	Peak Flow to Inlet (cfs)	Peak Flow Intercepted By Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency During Peak Flow (%)	Max Gutter Spread During Peak Flow (ft)	Max Gutter Water Depth During Peak Flow (ft)	Reported Condition Under Design Storm Flows	Investigation Priority
38	On Grade	1	6969.40	6971.78	20.00	12.19	4.62	7.58	37.87	16.89	0.42	Sufficient	N/A
39	In Sag	1	6968.57	6970.96	20.00	0.00	N/A	N/A	N/A	0.00	0.00	Sufficient	N/A
40	In Sag	1	6962.16	6964.36	20.00	3.90	N/A	N/A	N/A	15.91	0.57	Investigate	L
41	On Grade	1	6970.88	6974.28	20.00	19.11	6.02	13.09	31.51	21.49	0.51	Investigate	L
42	On Grade	1	6966.18	6971.18	20.00	13.08	4.73	8.35	36.17	18.55	0.45	Investigate	L
45	On Grade	1	7011.02	7013.82	20.00	1.67	1.61	0.06	96.45	5.05	0.19	Sufficient	N/A
46	In Sag	1	7012.53	7017.21	20.00	0.59	N/A	N/A	N/A	1.62	0.18	Sufficient	N/A
47	On Grade	1	7013.15	7018.12	20.00	4.17	3.11	1.06	74.64	9.76	0.28	Sufficient	N/A
48	On Grade	1	7016.40	7018.66	20.00	1.94	1.79	0.14	92.65	6.32	0.21	Sufficient	N/A
49	In Sag	1	6993.04	6995.11	20.00	15.08	N/A	N/A	N/A	138.23	2.83	Investigate	H
50	On Grade	1	6875.16	6878.20	20.00	8.68	2.94	5.73	33.93	17.63	0.44	Investigate	L
51	In Sag	1	6992.70	6995.04	20.00	2.01	N/A	N/A	N/A	6.88	0.39	Sufficient	N/A
52	In Sag	1	6875.63	6878.20	20.00	1.20	N/A	N/A	N/A	3.57	0.27	Sufficient	N/A
53	In Sag	1	6990.88	6992.83	20.00	14.88	N/A	N/A	N/A	134.62	0.98	Investigate	M
54	In Sag	1	6988.96	6991.55	20.00	0.00	N/A	N/A	N/A	0.00	0.00	Sufficient	N/A
55	In Sag	1	6914.92	6921.87	20.00	1.78	N/A	N/A	N/A	5.96	0.37	Sufficient	N/A
56	In Sag	1	6873.64	6875.97	20.00	2.79	N/A	N/A	N/A	11.63	0.41	Sufficient	N/A
57	In Sag	1	6874.89	6877.04	20.00	41.61	N/A	N/A	N/A	4242.84	5.85	Investigate	H
58	In Sag	1	6966.99	6970.14	20.00	14.78	N/A	N/A	N/A	36.73	0.99	Investigate	M
60	In Sag	1	6890.63	6892.95	20.00	5.41	N/A	N/A	N/A	19.94	0.63	Investigate	L
61	On Grade	1	6890.40	6893.00	20.00	1.66	1.57	0.09	94.57	6.15	0.21	Sufficient	N/A
62	In Sag	1	6882.27	6885.47	20.00	4.03	N/A	N/A	N/A	14.94	0.52	Investigate	L
63	On Grade	1	6890.58	6893.28	20.00	0.49	0.49	0.00	100.00	2.76	0.14	Sufficient	N/A
64	In Sag	2	6922.18	6924.53	20.00	0.38	N/A	N/A	N/A	0.55	0.11	Sufficient	N/A
65	In Sag	1	6894.32	6896.32	20.00	78.31	N/A	N/A	N/A	3757.02	5.63	Investigate	H
66	In Sag	1	6890.80	6892.87	20.00	1.71	N/A	N/A	N/A	5.67	0.36	Sufficient	N/A
67	On Grade	1	6879.27	6884.60	20.00	0.57	0.57	0.00	99.92	3.80	0.16	Sufficient	N/A
68	On Grade	1	6877.93	6883.93	20.00	1.73	1.61	0.12	92.83	7.20	0.23	Sufficient	N/A
69	On Grade	1	6886.73	6893.33	20.00	6.11	3.98	2.13	65.14	12.50	0.33	Sufficient	N/A
70	In Sag	1	6874.95	6876.95	20.00	1.08	N/A	N/A	N/A	3.83	0.28	Sufficient	N/A
71	On Grade	1	6874.89	6876.52	20.00	11.40	5.93	5.47	51.98	16.21	0.41	Sufficient	N/A
72	On Grade	1	6887.19	6893.19	20.00	1.45	1.39	0.06	95.84	6.61	0.22	Sufficient	N/A
73	In Sag	1	6912.31	6914.61	20.00	1.11	N/A	N/A	N/A	3.23	0.31	Sufficient	N/A
74	In Sag	1	6913.30	6915.40	20.00	4.20	N/A	N/A	N/A	13.28	0.52	Investigate	L
75	On Grade	1	6912.71	6915.61	20.00	0.85	0.85	0.00	99.98	3.53	0.15	Sufficient	N/A
76	On Grade	2	6913.09	6915.49	20.00	1.31	1.31	0.00	100.00	5.51	0.19	Sufficient	N/A
77	In Sag	1	6912.77	6915.67	20.00	0.18	N/A	N/A	N/A	0.51	0.06	Sufficient	N/A
78	In Sag	1	6912.65	6914.65	20.00	0.28	N/A	N/A	N/A	0.77	0.09	Sufficient	N/A
79	In Sag	1	6912.09	6914.54	20.00	1.06	N/A	N/A	N/A	2.99	0.23	Sufficient	N/A
80	In Sag	1	6919.70	6924.30	20.00	3.34	N/A	N/A	N/A	11.34	0.48	Sufficient	N/A
81	In Sag	1	6907.33	6909.78	20.00	1.31	N/A	N/A	N/A	4.05	0.33	Sufficient	N/A
82	In Sag	1	6911.83	6913.58	20.00	0.00	N/A	N/A	N/A	0.00	0.00	Sufficient	N/A

Table 12
Storm Drain Inlet Analysis Results, 100-Year Storm

Inlet No.	Inlet Location	# Of Inlet Openings	Inlet Invert Elevation (ft)	Inlet Grate Elevation (ft)	Grate Clogging Factor (%)	Peak Flow to Inlet (cfs)	Peak Flow Intercepted By Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency During Peak Flow (%)	Max Gutter Spread During Peak Flow (ft)	Max Gutter Water Depth During Peak Flow (ft)	Reported Condition Under Design Storm Flows	Investigation Priority
83	In Sag	1	6907.23	6909.83	20.00	0.21	N/A	N/A	N/A	0.59	0.07	Sufficient	N/A
84	In Sag	1	6911.60	6913.35	20.00	1.22	N/A	N/A	N/A	3.65	0.32	Sufficient	N/A
85	On Grade	1	6912.39	6914.54	20.00	0.79	0.79	0.00	99.98	3.32	0.15	Sufficient	N/A
86	In Sag	1	6910.71	6917.46	20.00	1.83	N/A	N/A	N/A	6.18	0.35	Sufficient	N/A
87	In Sag	1	6914.91	6917.63	20.00	5.41	N/A	N/A	N/A	14.27	0.55	Investigate	L
88	In Sag	1	6910.66	6916.59	20.00	8.19	N/A	N/A	N/A	23.30	0.72	Investigate	L
89	In Sag	1	6909.80	6916.50	20.00	4.32	N/A	N/A	N/A	13.23	0.53	Investigate	L
90	In Sag	1	6916.83	6921.83	20.00	6.65	N/A	N/A	N/A	18.29	0.62	Investigate	L
91	In Sag	1	6915.39	6921.89	20.00	4.30	N/A	N/A	N/A	13.23	0.53	Investigate	L
92	In Sag	1	6916.83	6921.78	20.00	7.10	N/A	N/A	N/A	19.77	0.65	Investigate	L
93	In Sag	1	6920.75	6924.20	20.00	8.87	N/A	N/A	N/A	16.91	0.59	Investigate	L
94	In Sag	1	6920.17	6924.17	20.00	6.44	N/A	N/A	N/A	14.22	0.54	Investigate	L
95	On Grade	1	6935.64	6939.14	20.00	3.68	2.82	0.85	76.76	10.23	0.29	Sufficient	N/A
96	On Grade	1	6936.02	6939.16	20.00	0.35	0.35	0.00	100.00	3.10	0.12	Sufficient	N/A
96A	On Grade	1	6936.34	6939.08	20.00	0.80	0.80	0.00	99.65	5.63	0.20	Sufficient	N/A
97	On Grade	1	6935.02	6939.12	20.00	2.07	1.86	0.22	89.53	7.96	0.24	Sufficient	N/A
98	In Sag	1	6933.24	6935.72	20.00	3.49	N/A	N/A	N/A	11.80	0.49	Sufficient	N/A
99	In Sag	1	6931.39	6935.69	20.00	7.25	N/A	N/A	N/A	15.12	0.55	Investigate	L
100	In Sag	1	6934.11	6936.14	20.00	4.36	N/A	N/A	N/A	13.09	0.52	Investigate	L
101	In Sag	1	6928.47	6934.00	20.00	3.10	N/A	N/A	N/A	10.60	0.44	Sufficient	N/A
102	In Sag	1	6927.66	6935.61	20.00	3.16	N/A	N/A	N/A	10.79	0.44	Sufficient	N/A
103	In Sag	1	6925.31	6933.84	20.00	2.12	N/A	N/A	N/A	7.26	0.39	Sufficient	N/A
104	On Grade	1	6925.94	6931.18	20.00	5.44	3.70	1.74	68.08	11.35	0.31	Sufficient	N/A
105	On Grade	1	6925.92	6931.12	20.00	4.50	3.26	1.24	72.47	10.49	0.29	Sufficient	N/A
106	In Sag	1	6922.39	6930.94	20.00	2.76	N/A	N/A	N/A	9.47	0.43	Sufficient	N/A
107	In Sag	1	6921.98	6930.41	20.00	3.62	N/A	N/A	N/A	12.21	0.49	Sufficient	N/A
108	In Sag	1	6921.64	6930.54	20.00	3.30	N/A	N/A	N/A	11.23	0.48	Sufficient	N/A
110	In Sag	1	6948.32	6951.02	20.00	7.39	N/A	N/A	N/A	15.27	0.56	Investigate	L
111	In Sag	2	6948.20	6950.82	20.00	4.59	N/A	N/A	N/A	11.34	0.48	Sufficient	N/A
112	On Grade	1	6962.40	6964.36	20.00	28.48	10.46	18.03	36.71	25.05	0.58	Investigate	L
113	In Sag	1	7033.29	7043.29	20.00	2.84	N/A	N/A	N/A	7.13	0.45	Sufficient	N/A
114	In Sag	1	6922.94	6925.04	20.00	1.98	N/A	N/A	N/A	6.76	0.39	Sufficient	N/A
115	In Sag	1	6922.45	6925.00	20.00	0.73	N/A	N/A	N/A	2.03	0.22	Sufficient	N/A
117	On Grade	1	6896.26	6898.79	20.00	0.89	0.89	0.00	99.60	5.73	0.20	Sufficient	N/A
118	In Sag	1	6997.33	6999.33	20.00	3.54	N/A	N/A	N/A	13.71	0.52	Investigate	L
119	In Sag	1	7031.80	7040.87	20.00	0.36	N/A	N/A	N/A	1.04	0.11	Sufficient	N/A
120	On Grade	1	6921.65	6924.15	20.00	0.58	0.58	0.00	99.91	3.84	0.16	Sufficient	N/A
121	In Sag	4	7056.62	7066.00	20.00	35.86	N/A	N/A	N/A	15.09	0.83	Investigate	M

Note: "Peak Flow intercepted by Inlet (cfs)", "Peak Flow Bypassing Inlet (cfs)", and "Inlet Efficiency During Peak Flow (%)" are all shown as "N/A" for inlets located in sag condition. Model assumes 100% capture of flows regardless of water depth and spread.

Table 13
Stormwater Pond Analysis Results, 5-Year Storm

Pond No.	Pond Bottom Elevation (ft)	Pond Rim Elevation (ft)	Overflow Depth (ft)	Pond Volume (ac-ft)	Peak Flow to Pond (cfs)	Peak Outflow from Outlet Structure (cfs)	Peak Overflow (cfs)	Total Peak Discharge incl Overflow (cfs)	Maximum Water Depth (ft)	Condition Under Design Storm Flows	Percent Reduction in Flow
1	7008.00	7010.00	2.00	0.207	44.71	0.97	42.86	43.83	> 2.00	OVERTOPS	2%
2	6972.00	6974.00	2.00	0.678	16.98	2.05	0.00	2.05	1.89	detained	88%
3	6966.10	6967.50	1.40	0.246	37.02	4.06	28.77	32.83	> 1.40	OVERTOPS	11%
5	6963.08	6965.12	2.04	0.054	7.16	0.00	2.72	2.72	> 2.04	OVERTOPS	62%
6	6961.65	6962.78	1.13	0.040	2.42	0.24	1.75	1.99	> 1.13	OVERTOPS	18%
7	6964.58	6965.82	1.24	0.008	0.76	0.24	0.43	0.67	> 1.24	OVERTOPS	12%
8	6963.63	6965.09	1.46	0.007	1.57	0.88	0.69	1.57	> 1.46	OVERTOPS	0%
9	6963.70	6965.51	1.81	0.100	2.23	0.00	0.37	0.37	> 1.81	OVERTOPS	83%
10	6970.66	6971.08	0.42	0.023	1.47	0.00	1.29	1.29	> 0.42	OVERTOPS	12%
11	6958.82	6960.92	2.10	0.044	2.21	1.20	0.00	1.20	1.34	detained	46%
12	6960.70	6963.75	3.05	0.101	2.28	0.00	0.08	0.08	> 3.05	OVERTOPS	96%
13	6955.91	6956.81	0.90	0.067	3.46	1.21	0.00	1.21	0.80	detained	65%
14	6955.79	6956.26	0.47	0.025	2.23	0.38	1.82	2.20	> 0.47	OVERTOPS	1%
15	6973.84	6975.65	1.81	0.080	2.04	0.81	0.00	0.81	0.97	detained	60%
16	6973.50	6974.69	1.19	0.015	2.22	2.23	0.00	2.23	1.06	detained	0%
17	6929.88	6931.06	1.18	0.020	2.44	1.01	1.42	2.43	> 1.18	OVERTOPS	0%
18	6990.30	6992.91	2.61	0.203	0.99	0.00	0.00	0.00	1.28	detained	100%
19	7000.36	7009.16	8.80	3.729	8.48	1.62	0.00	1.62	1.33	detained	81%
20	7009.14	7014.02	4.88	0.161	4.41	0.65	0.00	0.65	3.01	detained	85%
21	7011.97	7016.17	4.20	0.092	1.37	0.00	0.00	0.00	1.68	detained	100%
22	7011.29	7014.84	3.55	0.089	2.74	0.82	0.00	0.82	1.27	detained	70%
23	6981.18	6988.85	7.67	0.761	15.69	3.89	0.00	3.89	3.50	detained	75%
24	6989.64	6992.53	2.89	0.700	14.05	2.94	0.00	2.94	2.72	detained	79%
25	6964.76	6969.74	4.98	0.403	12.05	2.45	0.00	2.45	2.83	detained	80%
26	6963.49	6964.76	1.27	0.020	1.95	0.00	1.93	1.93	> 1.27	OVERTOPS	1%
27	6959.59	6961.36	1.77	0.045	4.59	0.00	4.51	4.51	> 1.77	OVERTOPS	2%
28	6955.33	6958.10	2.77	0.055	7.93	0.00	7.84	7.84	> 2.77	OVERTOPS	1%
29	6928.58	6929.49	0.91	0.131	56.05	0.00	45.61	45.61	> 0.91	OVERTOPS	19%
30	6942.30	6946.42	4.12	3.662	39.90	1.35	4.61	5.96	> 4.12	OVERTOPS	85%
31	6919.99	6928.34	8.35	2.224	20.11	0.39	0.00	0.39	5.73	detained	98%
32	6908.76	6914.23	5.47	1.381	17.69	3.37	0.00	3.37	2.84	detained	81%
33	6912.59	6914.18	1.59	0.045	0.55	0.07	0.00	0.07	0.58	detained	87%
34	6907.06	6911.32	4.26	0.204	1.97	0.12	0.00	0.12	2.13	detained	94%
35	6924.17	6925.15	0.98	0.117	2.84	0.60	0.00	0.60	0.56	detained	79%
36	6916.89	6920.08	3.19	0.110	2.21	0.00	0.00	0.00	1.97	detained	100%
37	6874.30	6875.52	1.22	0.088	1.30	0.27	0.00	0.27	0.55	detained	79%
38	6857.42	6858.48	1.06	0.367	1.55	0.01	0.00	0.01	0.33	detained	99%
40	6966.21	6967.76	1.55	0.006	2.69	0.55	2.12	2.67	> 1.55	OVERTOPS	1%
41	6910.20	6914.00	3.80	0.140	2.74	0.09	0.00	0.09	1.54	detained	97%

Table 14
Stormwater Pond Analysis Results, 100-Year Storm

Pond No.	Pond Bottom Elevation (ft)	Pond Rim Elevation (ft)	Overflow Depth (ft)	Pond Volume (ac-ft)	Peak Flow to Pond (cfs)	Peak Outflow from Outlet Structure (cfs)	Peak Overflow (cfs)	Total Peak Discharge incl Overflow (cfs)	Maximum Water Depth (ft)	Condition Under Design Storm Flows	Percent Reduction in Flow	Pond Concern Level
1	7008.00	7010.00	2.00	0.207	141.09	0.94	107.80	108.74	> 2.00	OVERTOPS	23%	H
2	6972.00	6974.00	2.00	0.678	77.56	2.66	44.72	47.38	> 2.00	OVERTOPS	39%	H
3	6966.10	6967.50	1.40	0.246	71.54	4.04	43.88	47.92	> 1.40	OVERTOPS	33%	H
5	6963.08	6965.12	2.04	0.054	20.88	0.00	15.01	15.01	> 2.04	OVERTOPS	28%	M
6	6961.65	6962.78	1.13	0.040	4.24	0.25	3.94	4.19	> 1.13	OVERTOPS	1%	L
7	6964.58	6965.82	1.24	0.008	1.39	0.25	1.14	1.39	> 1.24	OVERTOPS	0%	L
8	6963.63	6965.09	1.46	0.007	2.69	0.97	1.73	2.70	> 1.46	OVERTOPS	0%	L
9	6963.70	6965.51	1.81	0.100	5.27	0.00	4.64	4.64	> 1.81	OVERTOPS	12%	L
10	6970.66	6971.08	0.42	0.023	2.90	0.00	2.75	2.75	> 0.42	OVERTOPS	5%	L
11	6958.82	6960.88	2.06	0.044	3.84	1.86	0.08	1.94	> 2.06	OVERTOPS	49%	L
12	6960.70	6963.75	3.05	0.101	3.96	0.00	3.10	3.10	> 3.05	OVERTOPS	22%	L
13	6955.91	6956.81	0.90	0.067	6.09	1.33	3.96	5.29	> 0.90	OVERTOPS	13%	L
14	6955.79	6956.26	0.47	0.025	4.51	0.51	3.90	4.41	> 0.47	OVERTOPS	2%	L
15	6973.84	6975.65	1.81	0.059	3.59	1.02	0.00	1.02	1.56	detained	72%	N/A
16	6973.50	6974.69	1.19	0.010	3.80	3.78	0.00	3.78	1.11	detained	1%	N/A
17	6929.88	6931.06	1.18	0.020	4.24	1.24	2.98	4.22	> 1.18	OVERTOPS	0%	L
18	6990.30	6992.91	2.61	0.203	2.08	0.01	0.00	0.01	2.10	detained	100%	N/A
19	7000.36	7009.16	8.80	3.729	15.50	2.29	0.00	2.29	2.30	detained	85%	N/A
20	7009.14	7014.02	4.88	0.161	9.37	0.87	0.00	0.87	4.70	detained	91%	N/A
21	7011.97	7016.17	4.20	0.092	2.90	0.00	0.00	0.00	2.77	detained	100%	N/A
22	7011.29	7014.84	3.55	0.089	6.10	1.19	0.00	1.19	2.56	detained	80%	N/A
23	6981.18	6988.85	7.67	0.761	25.66	4.55	0.00	4.55	6.60	detained	82%	N/A
24	6989.64	6992.53	2.89	0.700	25.89	5.74	16.34	22.08	> 2.89	OVERTOPS	15%	M
25	6964.76	6969.74	4.98	0.403	16.88	2.90	0.00	2.90	3.66	detained	83%	N/A
26	6963.49	6964.76	1.27	0.020	3.42	0.00	3.39	3.39	> 1.27	OVERTOPS	1%	L
27	6959.59	6961.36	1.77	0.045	8.11	0.00	8.01	8.01	> 1.77	OVERTOPS	1%	L
28	6955.33	6958.10	2.77	0.055	14.02	0.00	13.91	13.91	> 2.77	OVERTOPS	1%	M
29	6928.58	6929.49	0.91	0.131	102.99	0.00	44.19	44.19	> 0.91	OVERTOPS	57%	H
30	6942.30	6946.42	4.12	3.662	82.75	1.40	23.86	25.26	> 4.12	OVERTOPS	69%	H
31	6919.99	6928.34	8.35	2.224	40.85	6.49	0.00	6.49	6.54	detained	84%	N/A
32	6908.76	6914.23	5.47	1.381	88.34	7.73	0.00	7.73	4.41	detained	91%	N/A
33	6912.59	6914.18	1.59	0.045	1.08	0.10	0.00	0.10	1.08	detained	91%	N/A
34	6907.06	6911.32	4.26	0.204	4.05	0.21	0.00	0.21	3.28	detained	95%	N/A
35	6924.17	6925.15	0.98	0.117	5.79	0.68	1.49	2.17	> 0.98	OVERTOPS	63%	L
36	6916.89	6920.08	3.19	0.110	3.71	0.00	0.00	0.00	2.81	detained	100%	N/A
37	6874.30	6875.52	1.22	0.088	3.26	0.43	0.00	0.43	1.19	detained	87%	N/A
38	6857.42	6858.48	1.06	0.367	3.36	0.01	0.00	0.01	0.67	detained	100%	N/A
40	6966.21	6967.76	1.55	0.006	4.87	0.64	4.18	4.82	> 1.55	OVERTOPS	1%	L
41	6910.20	6914.00	3.80	0.140	4.75	0.13	0.00	0.13	2.31	detained	97%	N/A

Table 15
Budgetary Costs for Culvert Improvements

Pipe ID#	Existing Pipe Diameter (In)	Assumed Replacement Pipe Diameter (In)	Pipe Length (Ft)	Unit Cost/Ft	Estimated Replacement Cost	Priority	High Priority Cost	Medium Priority Cost	Low Priority Cost
1	24	30	52	$ 136.05	$ 7,074.60	H	$ 7,074.60		
2	24	30	40	$ 136.05	$ 5,442.00	H	$ 5,442.00		
3	18	24	39	$ 111.95	$ 4,366.05	L			$ 4,366.05
6	18	24	42	$ 111.95	$ 4,701.90	H	$ 4,701.90		
7	15	18	85	$ 98.25	$ 8,351.25	H	$ 8,351.25		
8	15	18	34	$ 98.25	$ 3,340.50	L			$ 3,340.50
9	18	24	59	$ 111.95	$ 6,605.05	M		$ 6,605.05	
16	18	24	74	$ 111.95	$ 8,284.30	M		$ 8,284.30	
17	18	24	93	$ 111.95	$ 10,411.35	H	$ 10,411.35		
19	12	18	51	$ 98.25	$ 5,010.75	M		$ 5,010.75	
20	18	24	40	$ 111.95	$ 4,478.00	M		$ 4,478.00	
21	12	18	40	$ 98.25	$ 3,930.00	L			$ 3,930.00
22	15	18	39	$ 98.25	$ 3,831.75	M		$ 3,831.75	
24	8	18	27	$ 98.25	$ 2,652.75	L			$ 2,652.75
25	15	18	40	$ 98.25	$ 3,930.00	M		$ 3,930.00	
26	15	18	44	$ 98.25	$ 4,323.00	L			$ 4,323.00
27	24	30	36	$ 136.05	$ 4,897.80	L			$ 4,897.80
28	24	30	48	$ 136.05	$ 6,530.40	L			$ 6,530.40
29	24	30	98	$ 136.05	$ 13,332.90	L			$ 13,332.90
30	24	30	87	$ 136.05	$ 11,836.35	H	$ 11,836.35		
46	12	18	46	$ 98.25	$ 4,519.50	L			$ 4,519.50
47	12	18	45	$ 98.25	$ 4,421.25	M		$ 4,421.25	
48	15	18	24	$ 98.25	$ 2,358.00	M		$ 2,358.00	
49	15	18	55	$ 98.25	$ 5,403.75	M		$ 5,403.75	
50	15	18	40	$ 98.25	$ 3,930.00	H	$ 3,930.00		
55	12	18	52	$ 98.25	$ 5,109.00	M		$ 5,109.00	
60	24	30	107	$ 136.05	$ 14,557.35	H	$ 14,557.35		
61	15	18	36	$ 98.25	$ 3,537.00	M		$ 3,537.00	
63	24	30	46	$ 136.05	$ 6,258.30	M		$ 6,258.30	
66	36	42	21	$ 193.00	$ 4,053.00	H	$ 4,053.00		
67	24	30	163	$ 136.05	$ 22,176.15	H	$ 22,176.15		
68	18	24	60	$ 111.95	$ 6,717.00	M		$ 6,717.00	
70	30	36	128	$ 160.30	$ 20,518.40	M		$ 20,518.40	
73	18	24	70	$ 111.95	$ 7,836.50	H	$ 7,836.50		
79	24	30	44	$ 136.05	$ 5,986.20	L			$ 5,986.20
80	24	30	135	$ 136.05	$ 18,366.75	H	$ 18,366.75		
84	18	24	70	$ 111.95	$ 7,836.50	H	$ 7,836.50		
86	18	24	180	$ 111.95	$ 20,151.00	M		$ 20,151.00	
86A	18	24	53	$ 111.95	$ 5,933.35	M		$ 5,933.35	
90	18	24	59	$ 111.95	$ 6,605.05	L			$ 6,605.05
101	12	18	19	$ 98.25	$ 1,866.75	L			$ 1,866.75
104	12	18	40	$ 98.25	$ 3,930.00	L			$ 3,930.00
105	36	42	111	$ 193.00	$ 21,423.00	H	$ 21,423.00		
106	24	30	20	$ 136.05	$ 2,721.00	H	$ 2,721.00		
109	12	18	20	$ 98.25	$ 1,965.00	M		$ 1,965.00	
117	24	30	43	$ 136.05	$ 5,850.15	L			$ 5,850.15
123	18	24	48	$ 111.95	$ 5,373.60	M		$ 5,373.60	
139A	18	24	40	$ 111.95	$ 4,478.00	L			$ 4,478.00
143	12	18	71	$ 98.25	$ 6,975.75	H	$ 6,975.75		
144	12	18	89	$ 98.25	$ 8,744.25	L			$ 8,744.25
145	24	30	50	$ 136.05	$ 6,802.50	M		$ 6,802.50	
145A	18	24	20	$ 111.95	$ 2,239.00	L			$ 2,239.00

Table 15
Budgetary Costs for Culvert Improvements

Pipe ID#	Existing Pipe Diameter (In)	Assumed Replacement Pipe Diameter (In)	Pipe Length (Ft)	Unit Cost/Ft	Estimated Replacement Cost	Priority	High Priority Cost	Medium Priority Cost	Low Priority Cost
149	24	30	73	$ 136.05	$ 9,931.65	H	$ 9,931.65		
170	15	18	54	$ 98.25	$ 5,305.50	M		$ 5,305.50	
172	24	30	39	$ 136.05	$ 5,305.95	L			$ 5,305.95
177	15	18	60	$ 98.25	$ 5,895.00	H	$ 5,895.00		
210	8	18	20	$ 98.25	$ 1,965.00	L			$ 1,965.00
221	12	18	24	$ 98.25	$ 2,358.00	H	$ 2,358.00		
				Total	**$ 402,734.85**		**$ 175,878.10**	**$ 131,993.50**	**$ 94,863.25**

ASSUMPTIONS:

1. Unit price per foot includes material cost, trenching and backfill cost, pipe bedding cost, pipe removal and disposal cost, traffic control costs, Asphalt removal/disposal/ & replacement cost.
2. Pipe size is based on increasing existing pipe size to next larger standard pipe size, except that the minimal pipe size would not to be less than 18-in diameter.

Table 16
Budgetary Costs for Storm Drain Improvements

System Location	Pipe	Inlet	Priority	Included in Cost	% Value in Cost	Existing Pipe Diameter (in)	Replacement or Supplemetal Item	Quantity (LF Pipe or Each Inlet)	Unit Cost	Cost	Subtotal	Total Including Engineering and Contingency	Priority	High Priority Cost	Medium Priority Cost	Low Priority Cost
Dove Ranch East	42		N/A	N	N/A	24	N/A	N/A	N/A		$ 14,770.50	$ 19,201.65	L			$ 19,201.65
	43		N/A	N	N/A	24	N/A	N/A	N/A							
	44		N/A	Y	50%	36	42" HDPE	97	$ 193.00	$ 9,360.50						
		8	N/A	N	N/A		N/A	N/A	N/A							
		9	N/A	N	N/A		N/A	N/A	N/A							
		10	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
Dove Ranch West	39A		H	Y	100%	18	24" HDPE	125	$ 111.95	$ 13,993.75	$ 226,324.60	$ 294,221.98	H	$ 294,221.98		
	39B		H	Y	100%	18	24" HDPE	36	$ 111.95	$ 4,030.20						
	38		N/A	y	50%	36	42" HDPE	582	$ 193.00	$ 56,163.00						
	37		N/A	y	50%	36	42" HDPE	97	$ 193.00	$ 9,360.50						
	35		N/A	y	50%	36	42" HDPE	275	$ 193.00	$ 26,537.50						
	33		N/A	Y	50%	36	42" HDPE	365	$ 193.00	$ 35,222.50						
	40		M	Y	100%	24	30" HDPE	136	$ 136.05	$ 18,502.80						
	41A		N/A	Y	50%	36	42" HDPE	76	$ 193.00	$ 7,334.00						
	41		M	Y	100%	24	30" HDPE	45	$ 136.05	$ 6,122.25						
	34A		N/A	y	50%	24	30" HDPE	168	$ 136.05	$ 11,428.20						
	34B		H	y	100%	24	30" HDPE	19	$ 136.05	$ 2,584.95						
	34C		L	y	100%	24	30" HDPE	19	$ 136.05	$ 2,584.95						
		1	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		2	M	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		113	N/A	N	N/A		N/A	N/A	N/A							
		3	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		4	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		5	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		6	N/A	N	N/A		N/A	N/A	N/A							
		7	N/A	N	N/A		N/A	N/A	N/A							
		121	M	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
E Lakeside Drive	23A		N/A	N	N/A	12	N/A	N/A	N/A		$ 16,610.50	$ 21,593.65	M		$ 21,593.65	
	23B		H	Y	100%	12	18" HDPE	114	$ 98.25	$ 11,200.50						
		118	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		16	N/A	N	N/A		N/A	N/A	N/A							
Mountain View and Oak	18		L	Y	100%	12	18" HDPE	39	$ 98.25	$ 3,831.75	$ 13,859.50	$ 18,017.35	L			$ 18,017.35
	18A		N/A	Y	50%	12	18" HDPE	94	$ 98.25	$ 4,617.75						
		15	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
Mountain View and Center Drive	51		H	Y	100%	12	18" HDPE	162	$ 98.25	$ 15,916.50	$ 34,688.50	$ 45,095.05	H	$ 45,095.05		
	52		M	Y	100%	12	18" HDPE	70	$ 98.25	$ 6,877.50						
	53		L	Y	100%	12	18" HDPE	66	$ 98.25	$ 6,484.50						
		38	N/A	N	N/A		N/A	N/A	N/A							
		37	H	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		39	N/A	N	N/A		N/A	N/A	N/A							
Colorado Drive	56		H	Y	100%	15	18" HDPE	109	$ 98.25	$ 10,709.25	$ 23,782.75	$ 30,917.58	H	$ 30,917.58		
	58		H	Y	100%	15	18" HDPE	78	$ 98.25	$ 7,663.50						
		40	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
Commerce and Colorado Drive	59		L	Y	100%	18	24" HDPE	36	$ 111.95	$ 4,030.20	$ 16,157.20	$ 21,004.36	M		$ 21,004.36	
	57		H	Y	100%	18	24" HDPE	60	$ 111.95	$ 6,717.00						
		112	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
Roundabout	110		N/A	N	N/A	24	N/A	N/A	N/A		$ 38,606.20	$ 50,188.06	L			$ 50,188.06
	110A		H	Y	100%	24	30" HDPE	21	$ 136.05	$ 2,857.05						
	111		N/A	Y	50%	24	30" HDPE	244	$ 136.05	$ 16,598.10						
	111A		N/A	Y	50%	24	30" HDPE	202	$ 136.05	$ 13,741.05						
		17	N/A	N	N/A		N/A	N/A	N/A							
		17B	N/A	N	N/A		N/A	N/A	N/A							
		17A	M	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		18	N/A	N	N/A		N/A	N/A	N/A							

Table 16
Budgetary Costs for Storm Drain Improvements

System Location	Pipe	Inlet	Priority	Included in Cost	% Value in Cost	Existing Pipe Diameter (in)	Replacement or Supplemetal Item	Quantity (LF Pipe or Each Inlet)	Unit Cost	Cost	Subtotal	Total Including Engineering and Contingency	Priority	High Priority Cost	Medium Priority Cost	Low Priority Cost
Kremer Drive and Bayfield Parkway	118		H	Y	100%	12	18" HDPE	45	$ 98.25	$ 4,421.25	$ 13,073.50	$ 16,995.55	H	$ 16,995.55		
	119		H	Y	100%	12	18" HDPE	33	$ 98.25	$ 3,242.25						
		16A	N/A	N	N/A		N/A	N/A	N/A							
		15A	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
Cinnamon and Kremer Drives North	93		N/A	N	N/A	18	N/A	N/A	N/A		$ 6,717.00	$ 8,732.10	M		$ 8,732.10	
	94		N/A	N	N/A	18	N/A	N/A	N/A							
	95		H	Y	100%	18	24" HDPE	60	$ 111.95	$ 6,717.00						
		45	N/A	N	N/A		N/A	N/A	N/A							
		46	N/A	N	N/A		N/A	N/A	N/A							
		47	N/A	N	N/A		N/A	N/A	N/A							
East Kremer Drive	97		L	Y	100%	18	24" HDPE	148	$ 111.95	$ 16,568.60	$ 25,505.03	$ 33,156.53	M		$ 33,156.53	
	98		N/A	Y	50%	18	24" HDPE	63	$ 111.95	$ 3,526.43						
		49	H	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		51	N/A	N	N/A		N/A	N/A	N/A							
SE Kremer Drive	96		N/A	Y	50%	18	24" HDPE	74	$ 111.95	$ 4,142.15	$ 27,688.05	$ 35,994.47	M		$ 35,994.47	
	96A		H	Y	100%	18	24" HDPE	162	$ 111.95	$ 18,135.90						
		53	M	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		54	N/A	N	N/A		N/A	N/A	N/A							
Joint Maintenance Facility West	88A		N/A	Y	50%	18	24" HDPE	59	$ 111.95	$ 3,302.53	$ 28,787.98	$ 37,424.37	L			$ 37,424.37
	88B		N/A	Y	50%	18	24" HDPE	207	$ 111.95	$ 11,586.83						
	88C		N/A	Y	50%	18	24" HDPE	55	$ 111.95	$ 3,078.63						
		41	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		42	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
Joint Maintenance Facility Southwest	89		H	Y	100%	15	18" HDPE	73	$ 98.25	$ 7,172.25	$ 12,582.25	$ 16,356.93	H	$ 16,356.93		
		58	M	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
Day Lily	85A		H	Y	100%	18	24" HDPE	12	$ 111.95	$ 1,343.40	$ 14,030.15	$ 18,239.20	H	$ 18,239.20		
	85B		H	Y	100%	18	24" HDPE	31	$ 111.95	$ 3,470.45						
	85C		H	Y	100%	18	24" HDPE	34	$ 111.95	$ 3,806.30						
		110	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		111	N/A	N	N/A		N/A	N/A	N/A							
Hwy 160 - CR 501	114		N/A	Y	50%	48	54" HDPE	165	$ 253.20	$ 20,889.00	$ 52,794.70	$ 68,633.11	H	$ 68,633.11		
	121		H	Y	100%	36	42" HDPE	99	$ 193.00	$ 19,107.00						
	121A		N/A	N	N/A	18	N/A	N/A	N/A							
	122		H	Y	100%	18	24" HDPE	66	$ 111.95	$ 7,388.70						
		19	H	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		20	N/A	N	N/A		N/A	N/A	N/A							
		21	N/A	N	N/A		N/A	N/A	N/A							
Hwy 160 - CR 521	69		N/A	N	N/A	21	N/A	N/A	N/A		$ 29,140.40	$ 37,882.52	M		$ 37,882.52	
	69A		L	Y	100%	10	18" HDPE	79	$ 98.25	$ 7,761.75						
	69B		H	Y	100%	21	24" HDPE	51	$ 111.95	$ 5,709.45						
	69C		N/A	N	N/A	10	N/A	N/A	N/A							
	70		N/A	Y	50%	30	36" HDPE	128	$ 160.30	$ 10,259.20						
		22	N/A	N	N/A		N/A	N/A	N/A							
		23	N/A	N	N/A		N/A	N/A	N/A							
		24	N/A	N	N/A		N/A	N/A	N/A							
		25	N/A	N	N/A		N/A	N/A	N/A							
		27	H	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
Bayfield Parkway - CR 521	72		N/A	Y	50%	24	30" HDPE	113	$ 136.05	$ 7,686.83	$ 13,436.95	$ 17,468.04	L			$ 17,468.04
	72A		N/A	Y	50%	24	30" HDPE	5	$ 136.05	$ 340.13						
		26	N/A	N	N/A		N/A	N/A	N/A							
		28	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						

Table 16
Budgetary Costs for Storm Drain Improvements

System Location	Pipe	Inlet	Priority	Included in Cost	% Value in Cost	Existing Pipe Diameter (in)	Replacement or Supplemetal Item	Quantity (LF Pipe or Each Inlet)	Unit Cost	Cost	Subtotal	Total Including Engineering and Contingency	Priority	High Priority Cost	Medium Priority Cost	Low Priority Cost
CR 521 North	78		N/A	N	N/A	8	N/A	N/A	N/A		$ 76,830.05	$ 99,879.07	H	$ 99,879.07		
	77		H	Y	100%	8	18" HDPE	150	$ 98.25	$ 14,737.50						
	76		H	Y	100%	8	18" HDPE	260	$ 98.25	$ 25,545.00						
	123A		H	Y	100%	8	18" HDPE	122	$ 98.25	$ 11,986.50						
	75		N/A	Y	50%	24	30" HDPE	35	$ 136.05	$ 2,380.88						
	75A		N/A	Y	50%	24	30" HDPE	5	$ 136.05	$ 340.13						
	74		N/A	Y	50%	24	30" HDPE	162	$ 136.05	$ 11,020.05						
		29	M	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		30	N/A	N	N/A		N/A	N/A	N/A							
		31	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		32	N/A	N	N/A		N/A	N/A	N/A							
		35	N/A	N	N/A		N/A	N/A	N/A							
		36	N/A	N	N/A		N/A	N/A	N/A							
CR 521 South	124		H	Y	100%	8	18" HDPE	168	$ 98.25	$ 16,506.00	$ 273,219.10	$ 355,184.83	H	$ 355,184.83		
	125		N/A	Y	50%	8	18" HDPE	108	$ 98.25	$ 5,305.50						
	126		H	Y	100%	8	18" HDPE	200	$ 98.25	$ 19,650.00						
	127		H	Y	100%	8	18" HDPE	249	$ 98.25	$ 24,464.25						
	129		N/A	Y	50%	24	30" HDPE	80	$ 136.05	$ 5,442.00						
	128		M	Y	100%	15	18" HDPE	30	$ 98.25	$ 2,947.50						
	130		N/A	Y	50%	24	30" HDPE	190	$ 136.05	$ 12,924.75						
	131		M	Y	100%	15	18" HDPE	56	$ 98.25	$ 5,502.00						
	132		H	Y	100%	24	30" HDPE	391	$ 136.05	$ 53,195.55						
	133		H	Y	100%	24	30" HDPE	689	$ 136.05	$ 93,738.45						
	134		H	Y	100%	18	24" HDPE	58	$ 111.95	$ 6,493.10						
		65	H	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		60	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		34	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		33	N/A	N	N/A		N/A	N/A	N/A							
		63	N/A	N	N/A		N/A	N/A	N/A							
		61	N/A	N	N/A		N/A	N/A	N/A							
		67	N/A	N	N/A		N/A	N/A	N/A							
		62	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		68	N/A	N	N/A		N/A	N/A	N/A							
		57	H	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		56	N/A	N	N/A		N/A	N/A	N/A							
South Street	137		H	Y	100%	8	18" HDPE	39.0	$ 98.25	$ 3,831.75	$ 121,630.60	$ 158,119.78	H	$ 158,119.78		
	138		M	Y	100%	15	18" HDPE	39.0	$ 98.25	$ 3,831.75						
	139		H	Y	100%	18	24" HDPE	294.0	$ 111.95	$ 32,913.30						
	140A		H	Y	100%	24	30" HDPE	556.0	$ 136.05	$ 75,643.80						
		52	N/A	N	N/A		N/A	N/A	N/A							
		50	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		70	N/A	N	N/A		N/A	N/A	N/A							
		71	N/A	N	N/A		N/A	N/A	N/A							
CR521 North of Mars Drive	141A		H	Y	100%	18	24" HDPE	61	$ 111.95	$ 6,828.95	$ 6,828.95	$ 8,877.64	M		$ 8,877.64	
		117	N/A	N	N/A		N/A	N/A	N/A							
Fox Farm NE2	148		L	Y	100%	12	18" HDPE	211	$ 98.25	$ 20,730.75	$ 22,990.50	$ 29,887.65	L			$ 29,887.65
	148A		M	Y	100%	12	18" HDPE	23	$ 98.25	$ 2,259.75						
		114	N/A	N	N/A		N/A	N/A	N/A							
		115	N/A	N	N/A		N/A	N/A	N/A							

Table 16
Budgetary Costs for Storm Drain Improvements

System Location	Pipe	Inlet	Priority	Included in Cost	% Value in Cost	Existing Pipe Diameter (in)	Replacement or Supplemetal Item	Quantity (LF Pipe or Each Inlet)	Unit Cost	Cost	Subtotal	Total Including Engineering and Contingency	Priority	High Priority Cost	Medium Priority Cost	Low Priority Cost
Fox Farm Circle-Jacobs Lane North	205C		N/A	N	N/A	12	N/A	N/A	N/A		$ 5,109.00	$ 6,641.70	L			$ 6,641.70
	205D		N/A	N	N/A	12	N/A	N/A	N/A							
	205E		M	Y	100%	12	18" HDPE	28	$ 98.25	$ 2,751.00						
	205		M	Y	100%	12	18" HDPE	24	$ 98.25	$ 2,358.00						
		73	N/A	N	N/A		N/A	N/A	N/A							
		79	N/A	N	N/A		N/A	N/A	N/A							
		82	N/A	N	N/A		N/A	N/A	N/A							
		84	N/A	N	N/A		N/A	N/A	N/A							
Fox Farm SW	206A		N/A	Y	50%	12	18" HDPE	28	$ 98.25	$ 1,375.50	$ 13,446.53	$ 17,480.48	L			$ 17,480.48
	206		N/A	Y	50%	18	24" HDPE	119	$ 111.95	$ 6,661.03						
		74	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		76	N/A	N	N/A		N/A	N/A	N/A							
Mesa Meadows West	174		H	Y	100%	15	18" HDPE	37	$ 98.25	$ 3,635.25	$ 105,621.85	$ 137,308.41	H	$ 137,308.41		
	150A		N/A	Y	50%	18	24" HDPE	40	$ 111.95	$ 2,239.00						
	173		H	Y	100%	15	18" HDPE	81	$ 98.25	$ 7,958.25						
	150		N/A	Y	50%	24	30" HDPE	294	$ 136.05	$ 19,999.35						
	175A		N/A	Y	50%	18	24" HDPE	40	$ 111.95	$ 2,239.00						
	151		N/A	Y	50%	24	30" HDPE	69	$ 136.05	$ 4,693.73						
	151A		N/A	Y	50%	24	30" HDPE	280	$ 136.05	$ 19,047.00						
	175		H	Y	100%	15	18" HDPE	37	$ 98.25	$ 3,635.25						
	176		N/A	Y	50%	18	24" HDPE	65	$ 111.95	$ 3,638.38						
	153A		L	Y	100%	15	18" HDPE	30	$ 98.25	$ 2,947.50						
	152		N/A	Y	50%	24	30" HDPE	46	$ 136.05	$ 3,129.15						
		93	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		80	N/A	N	N/A		N/A	N/A	N/A							
		94	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		92	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		90	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		91	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		55	N/A	N	N/A		N/A	N/A	N/A							
		86	N/A	N	N/A		N/A	N/A	N/A							
		87	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
Hickory Ridge SW	153		M	Y	100%	15	18" HDPE	37	$ 98.25	$ 3,635.25	$ 16,371.13	$ 21,282.46	M		$ 21,282.46	
	153B		N/A	Y	50%	15	18" HDPE	39	$ 98.25	$ 1,915.88						
		88	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		89	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						

Table 16
Budgetary Costs for Storm Drain Improvements

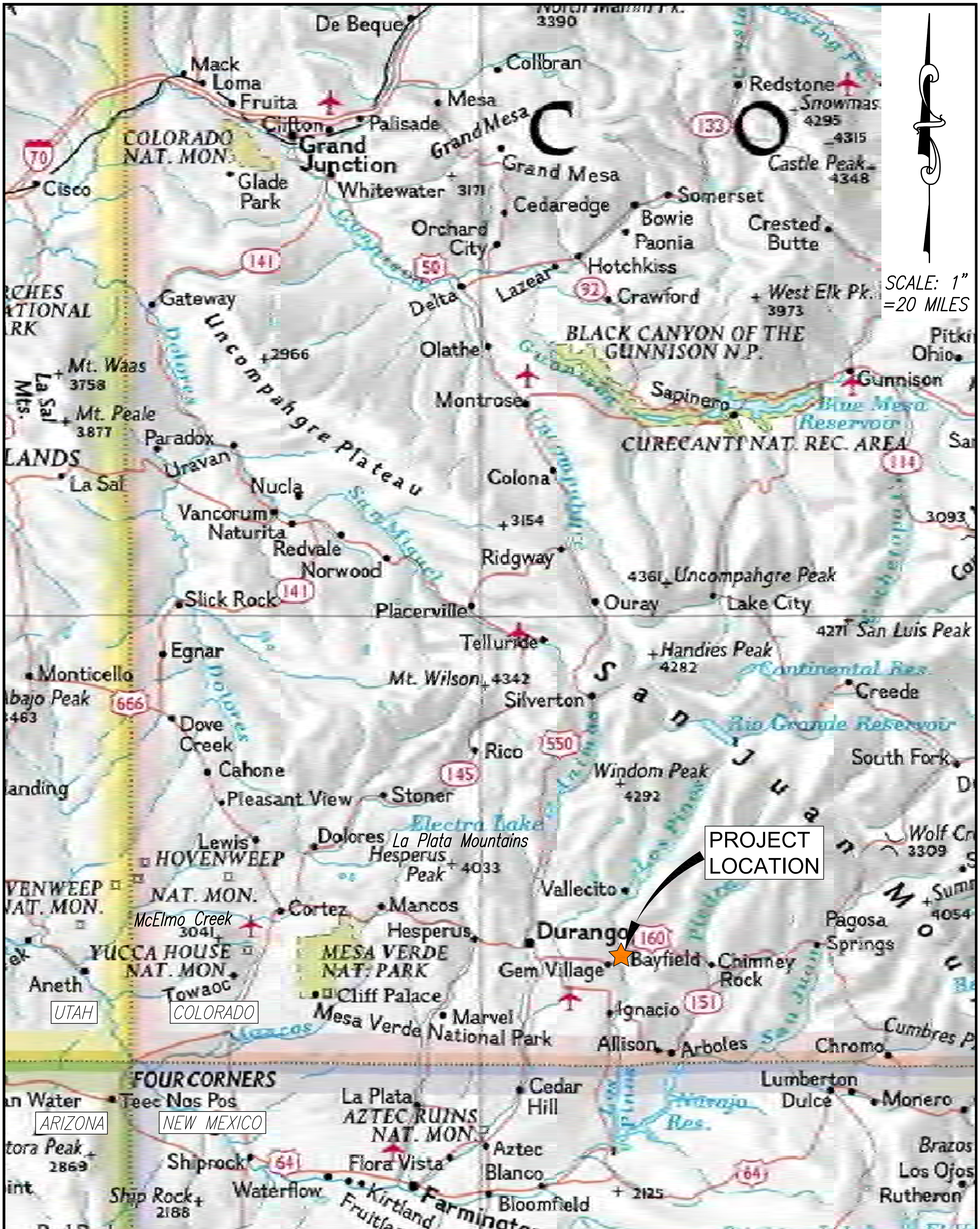
System Location	Pipe	Inlet	Priority	Included in Cost	% Value in Cost	Existing Pipe Diameter (in)	Replacement or Supplemetal Item	Quantity (LF Pipe or Each Inlet)	Unit Cost	Cost	Subtotal	Total Including Engineering and Contingency	Priority	High Priority Cost	Medium Priority Cost	Low Priority Cost
Mesa Meadows East	167		N/A	N	N/A	15	N/A	N/A	N/A		$ 112,465.63	$ 146,205.31	M		$ 146,205.31	
	166		N/A	N	N/A	15	N/A	N/A	N/A							
	168		N/A	N	N/A	15	N/A	N/A	N/A							
	169		N/A	N	N/A	24	N/A	N/A	N/A							
	165		N/A	N	N/A	24	N/A	N/A	N/A							
	164		H	Y	100%	15	18" HDPE	37	$ 98.25	$ 3,635.25						
	163		H	Y	100%	18	24" HDPE	50	$ 111.95	$ 5,597.50						
	162		M	Y	100%	24	30" HDPE	37	$ 136.05	$ 5,033.85						
	161		L	Y	100%	24	30" HDPE	51	$ 136.05	$ 6,938.55						
	160A		N/A	Y	50%	24	30" HDPE	171	$ 136.05	$ 11,632.28						
	160B		N/A	Y	50%	24	30" HDPE	91	$ 136.05	$ 6,190.28						
	160C		N/A	Y	50%	24	30" HDPE	71	$ 136.05	$ 4,829.78						
	159		N/A	N	N/A	15	N/A	N/A	N/A							
	158A		N/A	N	N/A	15	N/A	N/A	N/A							
	158		M	Y	100%	30	36" HDPE	151	$ 160.30	$ 24,205.30						
	157		N/A	Y	50%	30	36" HDPE	254	$ 160.30	$ 20,358.10						
	156		N/A	Y	50%	30	36" HDPE	59	$ 160.30	$ 4,728.85						
	154		N/A	Y	50%	30	36" HDPE	36	$ 160.30	$ 2,885.40						
	155		N/A	Y	50%	30	36" HDPE	70	$ 160.30	$ 5,610.50						
		96A	N/A	N	N/A		N/A	N/A	N/A							
		96	N/A	N	N/A		N/A	N/A	N/A							
		95	N/A	N	N/A		N/A	N/A	N/A							
		97	N/A	N	N/A		N/A	N/A	N/A							
		98	N/A	N	N/A		N/A	N/A	N/A							
		99	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		100	L	Y	100%		Inlet	1	$ 5,410.00	$ 5,410.00						
		102	N/A	N	N/A		N/A	N/A	N/A							
		103	N/A	N	N/A		N/A	N/A	N/A							
		101	N/A	N	N/A		N/A	N/A	N/A							
		104	N/A	N	N/A		N/A	N/A	N/A							
		105	N/A	N	N/A		N/A	N/A	N/A							
		106	N/A	N	N/A		N/A	N/A	N/A							
		107	N/A	N	N/A		N/A	N/A	N/A							
		108	N/A	N	N/A		N/A	N/A	N/A							
										Totals	$ 1,363,069.08	**$ 1,771,989.80**		**$ 1,240,951.47**	**$ 334,729.04**	**$ 196,309.30**

Table 17
Budgetary Costs for Pond Improvements

Pond #	Pond Volume (Ac-Ft)	Max Pond Depth (Ft)	Approximate Pond Area (SF)	Cleaning Needed?	Cost / SF to Clean Pond	Total Cost to Clean Pond	Existing Overflow Spillway?	Overflow Spillway Cost	Total Budgetary Cost
1	0.207	2.00	4,508	No	N/A	N/A	Yes	N/A	N/A
2	0.678	2.00	14,767	Yes	$ 0.25	$3,691.71	No	$ 3,000.00	$ 6,691.71
3	0.246	1.40	7,654	Yes	$ 0.50	$3,827.06	No	$ 2,000.00	$ 5,827.06
5	0.054	2.04	1,153	No	N/A	N/A	Yes	N/A	N/A
6	0.040	1.13	1,542	No	N/A	N/A	Yes	N/A	N/A
7	0.008	1.24	281	No	N/A	N/A	Yes	N/A	N/A
8	0.007	1.46	209	No	N/A	N/A	Yes	N/A	N/A
9	0.100	1.81	2,407	Yes	$ 1.00	$2,406.63	No	$ 2,000.00	$ 4,406.63
10	0.023	0.42	2,385	Yes	$ 1.00	$2,385.43	No	$ 750.00	$ 3,135.43
11	0.044	2.10	913	No	N/A	N/A	Yes	N/A	N/A
12	0.101	3.05	1,442	Yes	$ 1.00	$1,442.48	Yes	N/A	$ 1,442.48
13	0.067	0.90	3,243	No	N/A	N/A	No	$ 1,000.00	$ 1,000.00
14	0.025	0.47	2,317	No	N/A	N/A	Yes	N/A	N/A
15	0.080	1.81	1,925	No	N/A	N/A	Yes	N/A	N/A
16	0.015	1.19	549	No	N/A	N/A	No	$ 750.00	$ 750.00
17	0.020	1.18	738	No	N/A	N/A	Yes	N/A	N/A
18	0.203	2.61	3,388	No	N/A	N/A	No	$ 2,000.00	$ 2,000.00
19	3.729	8.80	18,459	No	N/A	N/A	No	$ 5,000.00	$ 5,000.00
20	0.161	4.88	1,437	No	N/A	N/A	No	$ 2,000.00	$ 2,000.00
21	0.092	4.20	954	Yes	$ 1.00	$ 954.17	No	$ 1,000.00	$ 1,954.17
22	0.089	3.55	1,092	No	N/A	N/A	No	$ 1,000.00	$ 1,000.00
23	0.761	7.67	4,322	No	N/A	N/A	No	$ 3,000.00	$ 3,000.00
24	0.582	2.89	8,772	No	N/A	N/A	No	$ 3,000.00	$ 3,000.00
25	0.403	4.98	3,525	No	N/A	N/A	Yes	N/A	N/A
26	0.020	1.27	686	No	N/A	N/A	No	$ 750.00	$ 750.00
27	0.045	1.77	1,107	No	N/A	N/A	No	$ 750.00	$ 750.00
28	0.055	2.77	865	Yes	$ 1.00	$ 864.91	No	$ 1,000.00	$ 1,864.91
29	0.131	0.91	6,271	No	N/A	N/A	No	$ 2,000.00	$ 2,000.00
30	3.662	4.12	38,718	No	N/A	N/A	No	$ 5,000.00	$ 5,000.00
31	2.224	8.35	11,602	No	N/A	N/A	Yes	N/A	N/A
32	1.381	5.47	10,998	No	N/A	N/A	Yes	N/A	N/A
33	0.045	1.59	1,233	No	N/A	N/A	Yes	N/A	N/A
34	0.204	4.26	2,086	Yes	$ 1.00	$2,085.97	No	$ 2,000.00	$ 4,085.97
35	0.117	0.98	5,201	No	N/A	N/A	Yes	N/A	N/A
36	0.110	3.19	1,502	No	N/A	N/A	No	$ 2,000.00	$ 2,000.00
37	0.088	1.22	3,142	No	N/A	N/A	Yes	N/A	N/A
38	0.367	1.06	15,082	No	N/A	N/A	Yes	N/A	N/A
40	0.006	1.55	169	No	N/A	N/A	No	$ 750.00	$ 750.00
41	0.140	3.80	1,605	Yes	$ 1.00	$1,604.84	No	$ 2,000.00	$ 3,604.84
								Total	**$ 62,013.20**

Assumptions:
Pond Cleaning Costs based on a Square Foot or Lump Sum Cost as follows:
a) Up to 500 SF: cleaning by hand only, lump sum cost of $1,000 per pond
b) 501 to 5000 SF: $1.00/SF
c) 5001 to 10,000 SF: 0.50/SF
d) Over 10,000 SF: $0.25/q-ft
Overflow Spillway - Assumes minor excavation to create spillway, spillway area lined with a geotextile material and covered with 6-inch clean rock for erosion protection. Spillway costs assumed as follows:
a) Up to 0.05 acre-feet: $750
b) 0.051 to 0.1 acre-feet: $1,000
c) 0.11 to 0.5 acre-feet: $2,000
d) 0.51 to 1 acre-feet: $3,000
e) Over 1 acre-feet: $5,000

Figures



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TOWN OF BAYFIELD — BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
VICINITY MAP

Designed	Drawn	Checked
RLM	DJB	BAA

Date: JUNE, 2014
Scale: Horiz: AS NOTED Vert: N/A
Project No: 9521537
Sheet: FIG 1

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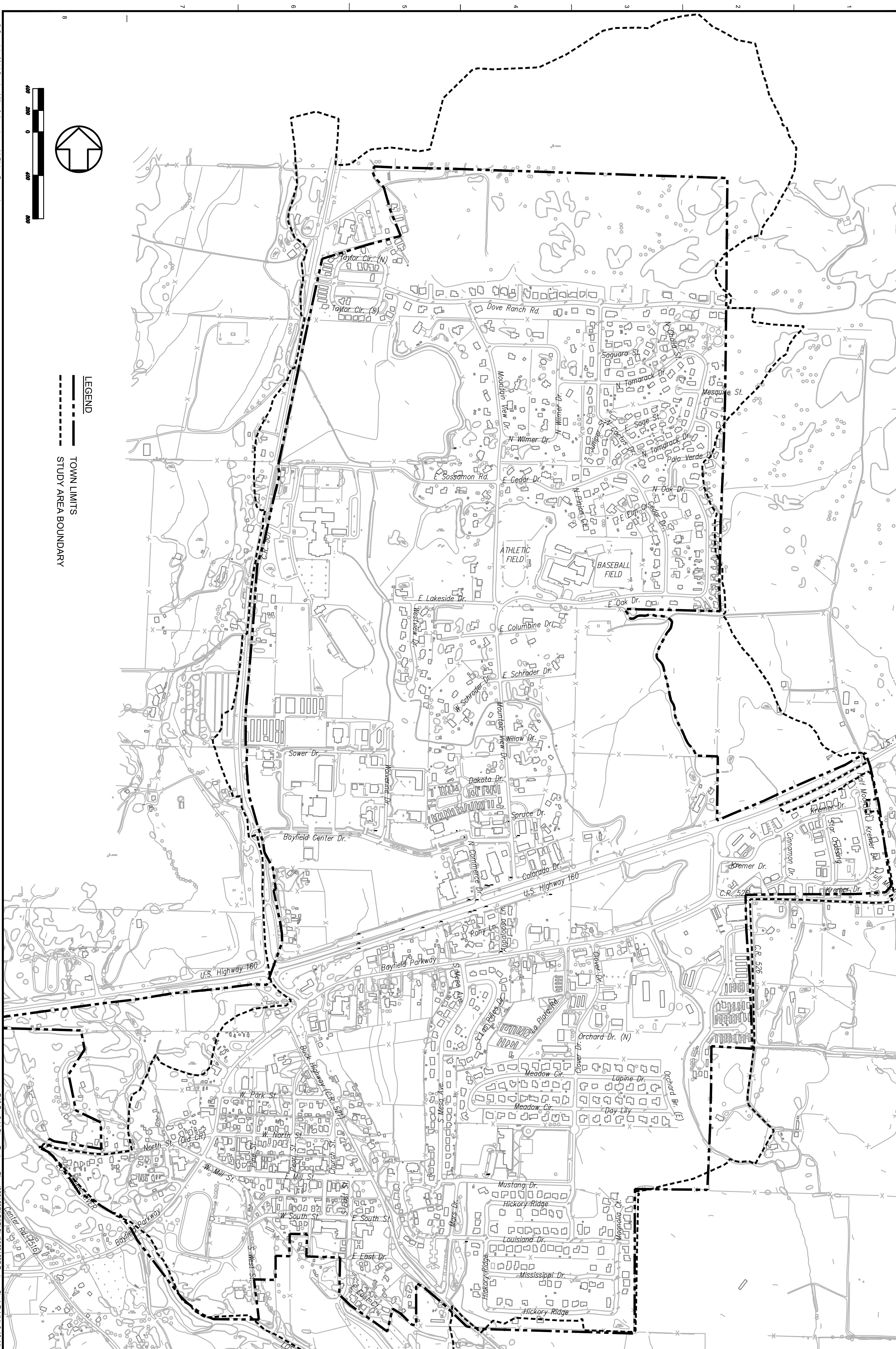

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TOWN OF BAYFIELD — BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
STUDY AREA BOUNDARY & TOWN LIMITS

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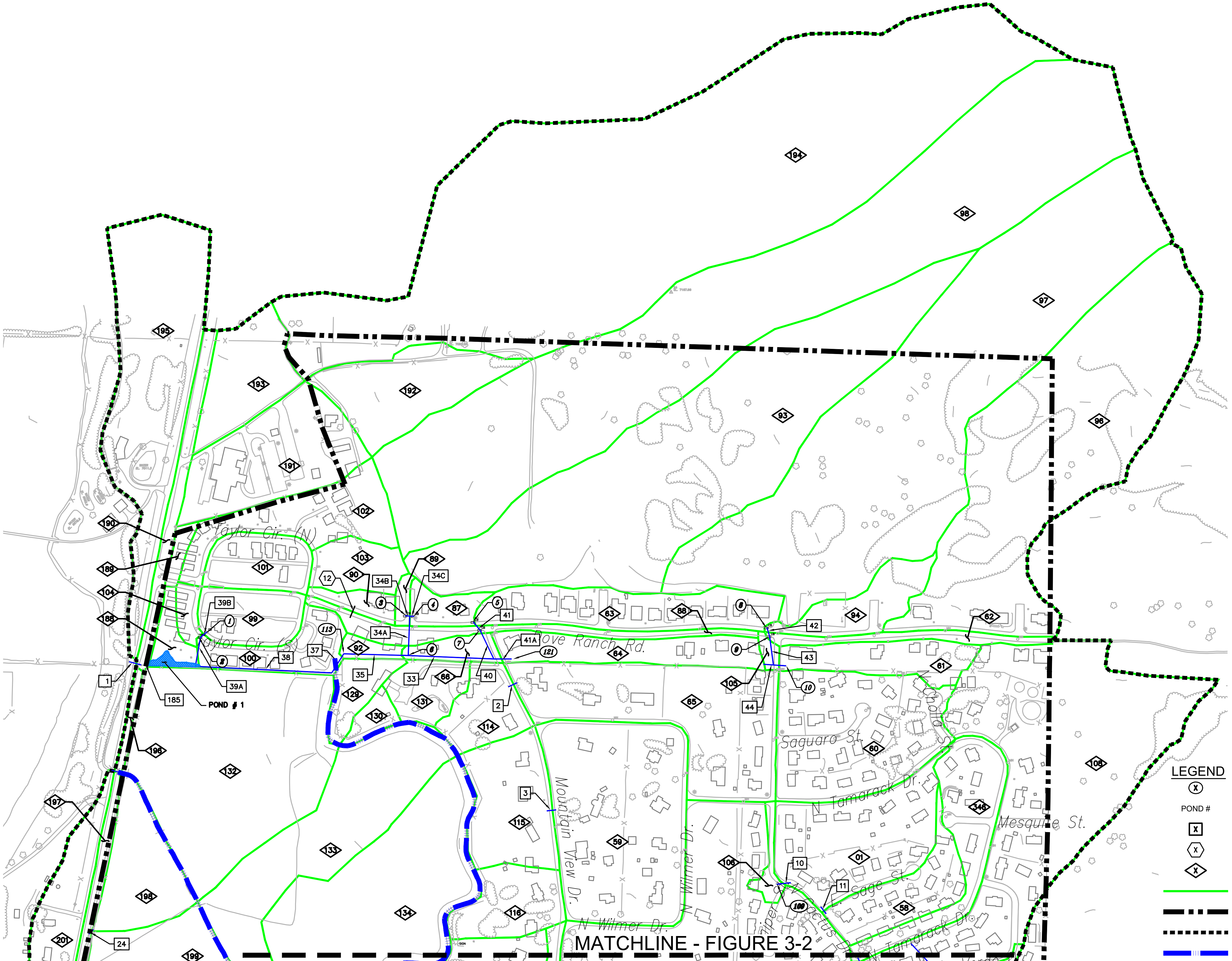

LEGEND

- (X) INLET
- POND # — POND INFO
- [X] CULVERT / STORM DRAIN PIPE
- ⬡X IRRIGATION PIPE / CULVERT
- ◇X BASIN ID
- BASIN BOUNDARY
- TOWN LIMITS
- STUDY AREA BOUNDARY
- IRRIGATION DITCH

200 100 0 200 400

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TOWN OF BAYFIELD — BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
CULVERT, INLET & POND LOCATION MAP
SYSTEM INVENTORY

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Scale: Horiz: 1"=200' Vert: N/A
Project No: 9521537
Sheet: FIG 3-1

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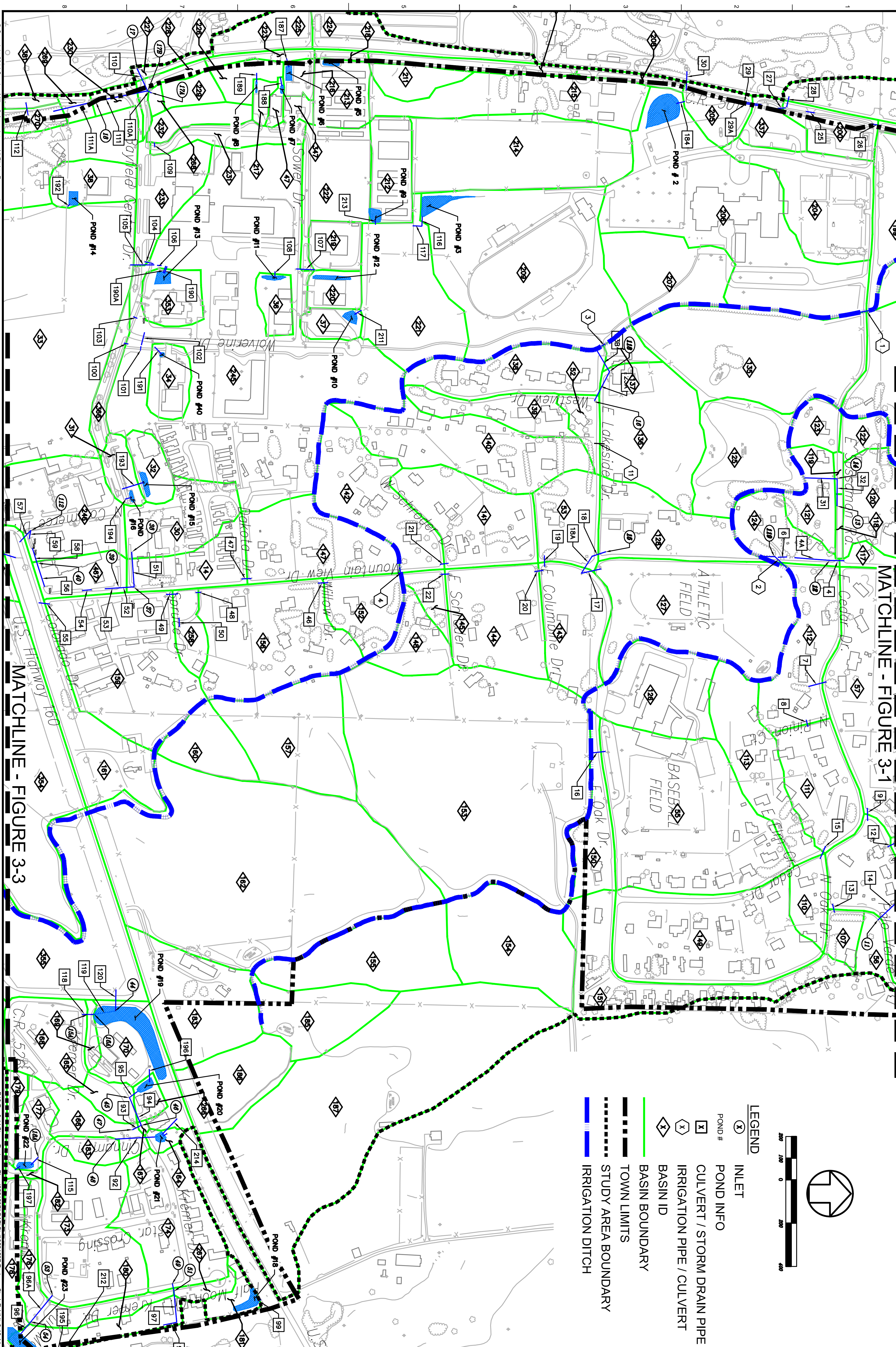

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Project No: 9521537

Sheet: FIG 3-2

TOWN OF BAYFIELD — BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
CULVERT, INLET & POND LOCATION MAP
SYSTEM INVENTORY

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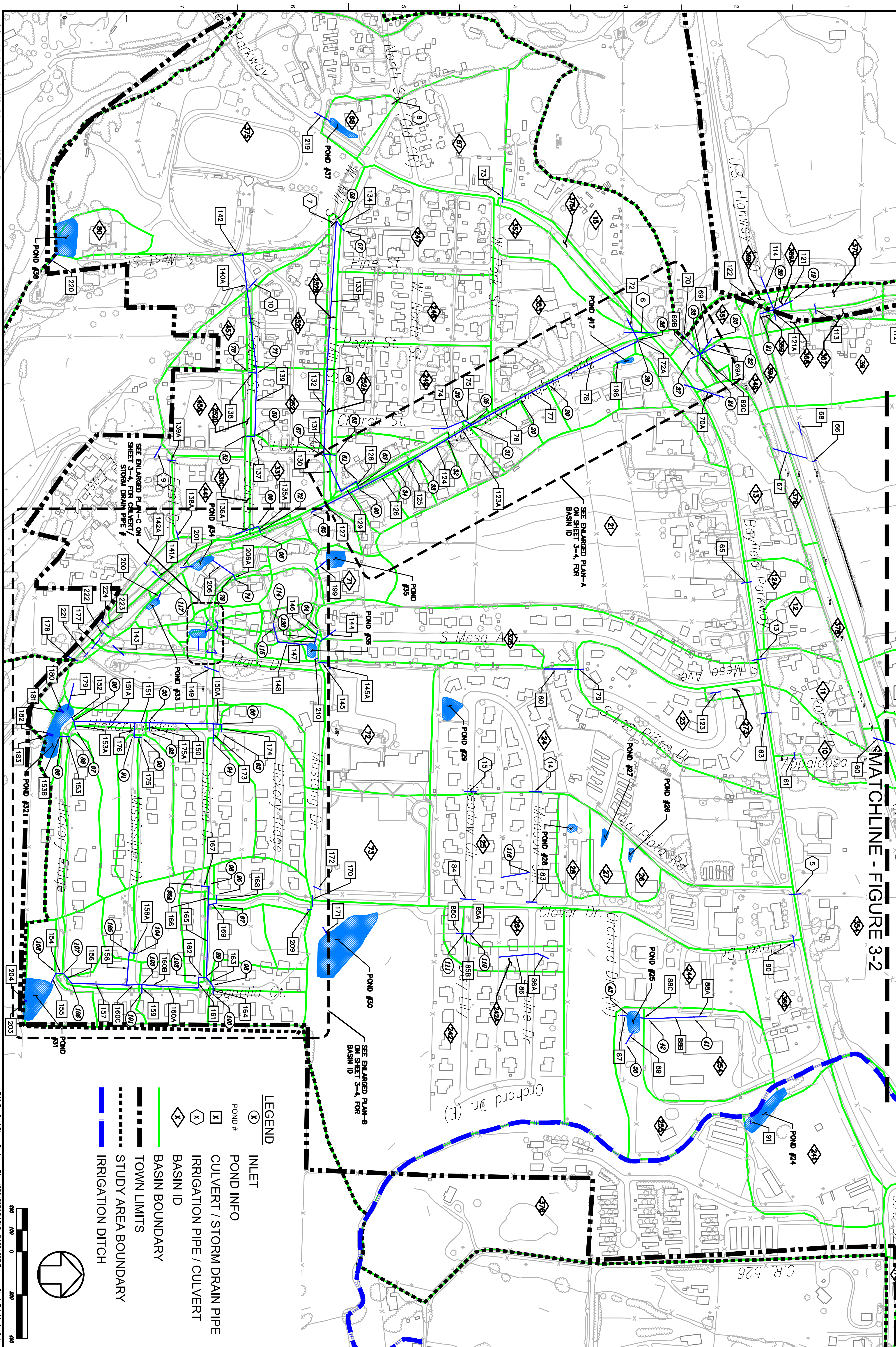

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Scale: Horiz: 1"=200' Vert: N/A
Project No: 9521537
Sheet: FIG 3-3

TOWN OF BAYFIELD — BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
CULVERT, INLET & POND LOCATION MAP
SYSTEM INVENTORY

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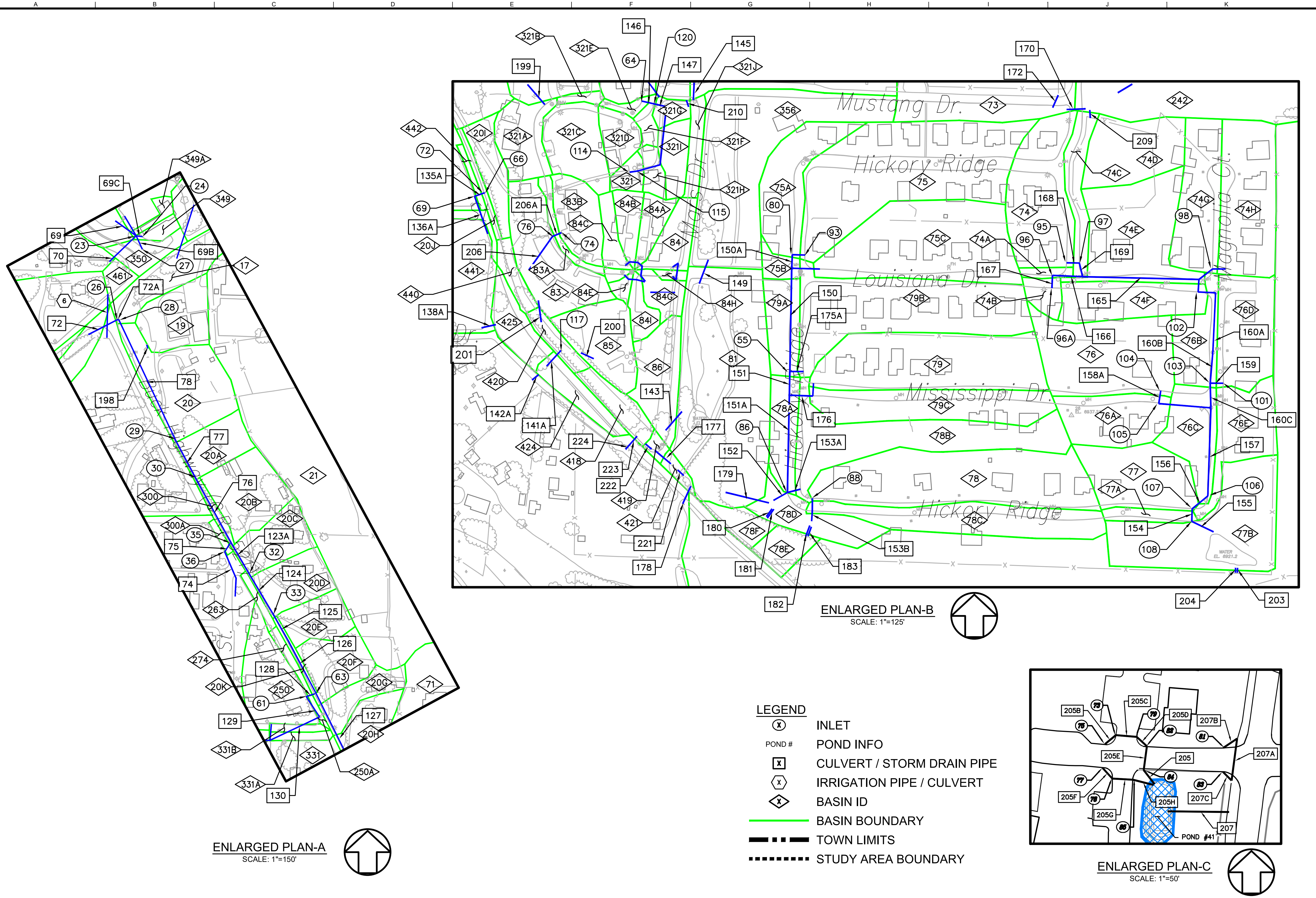

ENLARGED PLAN-A
SCALE: 1"=150'

ENLARGED PLAN-B
SCALE: 1"=125'

ENLARGED PLAN-C
SCALE: 1"=50'

LEGEND

- INLET
- POND # — POND INFO
- CULVERT / STORM DRAIN PIPE
- IRRIGATION PIPE / CULVERT
- BASIN ID
- BASIN BOUNDARY
- TOWN LIMITS
- STUDY AREA BOUNDARY

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TOWN OF BAYFIELD — BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
CULVERT, INLET & POND LOCATION MAP
SYSTEM INVENTORY

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Project No: 9521537
Sheet: FIG 3-4

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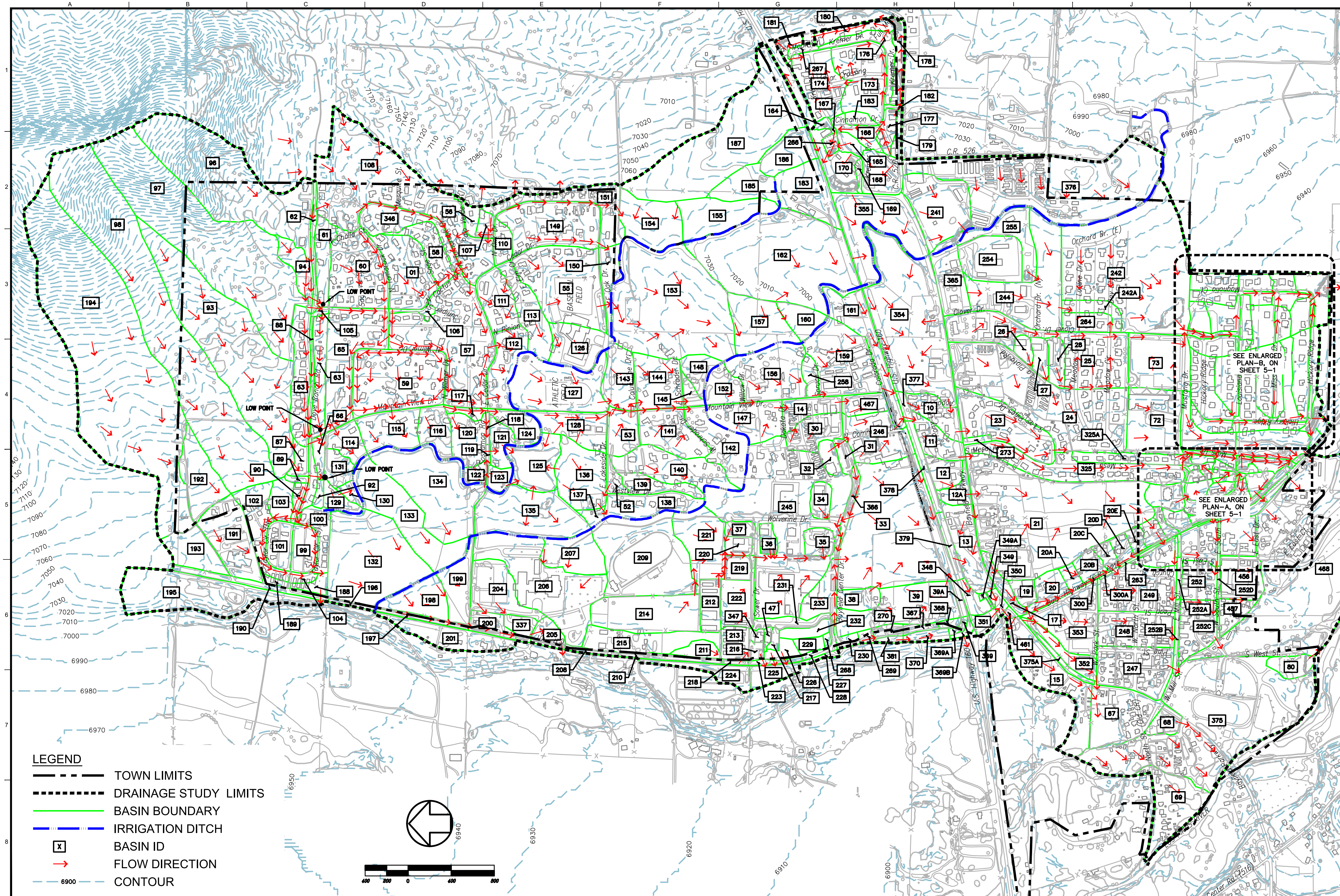

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TOWN OF BAYFIELD — BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
DRAINAGE STUDY AREA
FLOW PATHS

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Sheet: FIG 4-1

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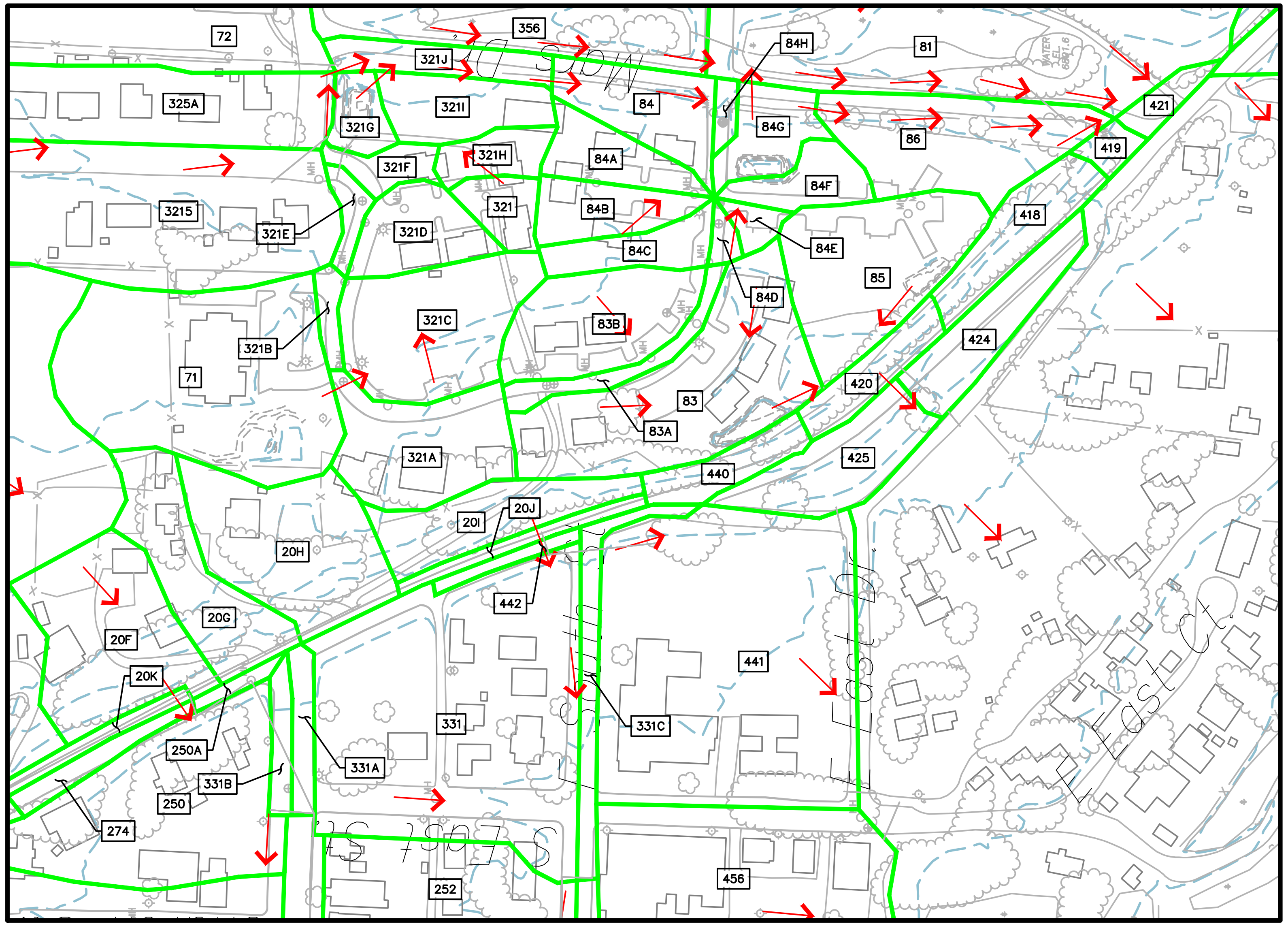
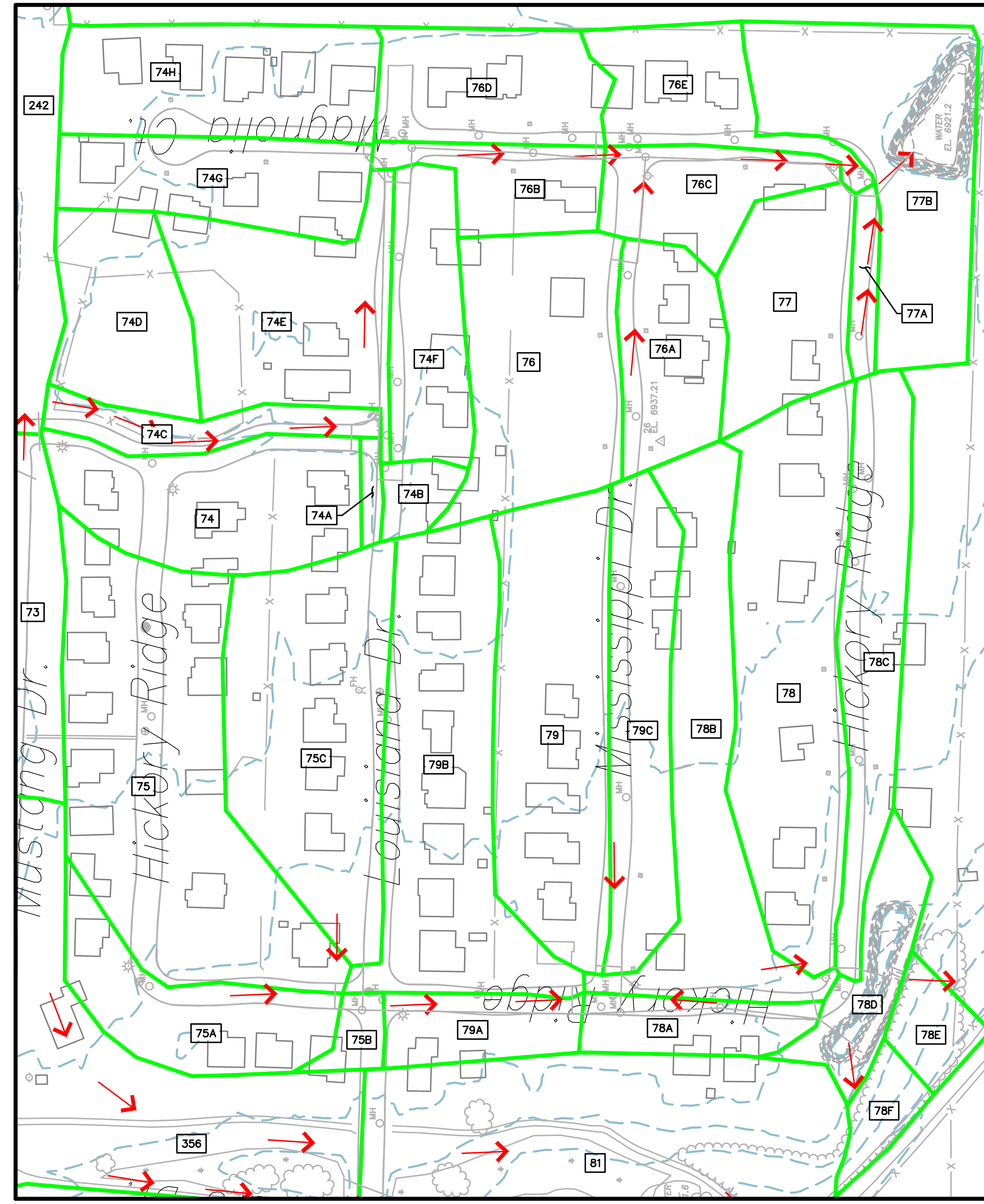


ENLARGED PLAN-A

SCALE: 1"=100'



ENLARGED PLAN-B

SCALE: 1"=100'

LEGEND

BASIN BOUNDARY

X BASIN ID

6900 CONTOUR

FLOW DIRECTION

100 50 0 100 200

TOWN OF BAYFIELD

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MASTER DRAINAGE PLAN
DRAINAGE STUDY AREA
FLOW PATHS

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Sheet: FIG 4-2

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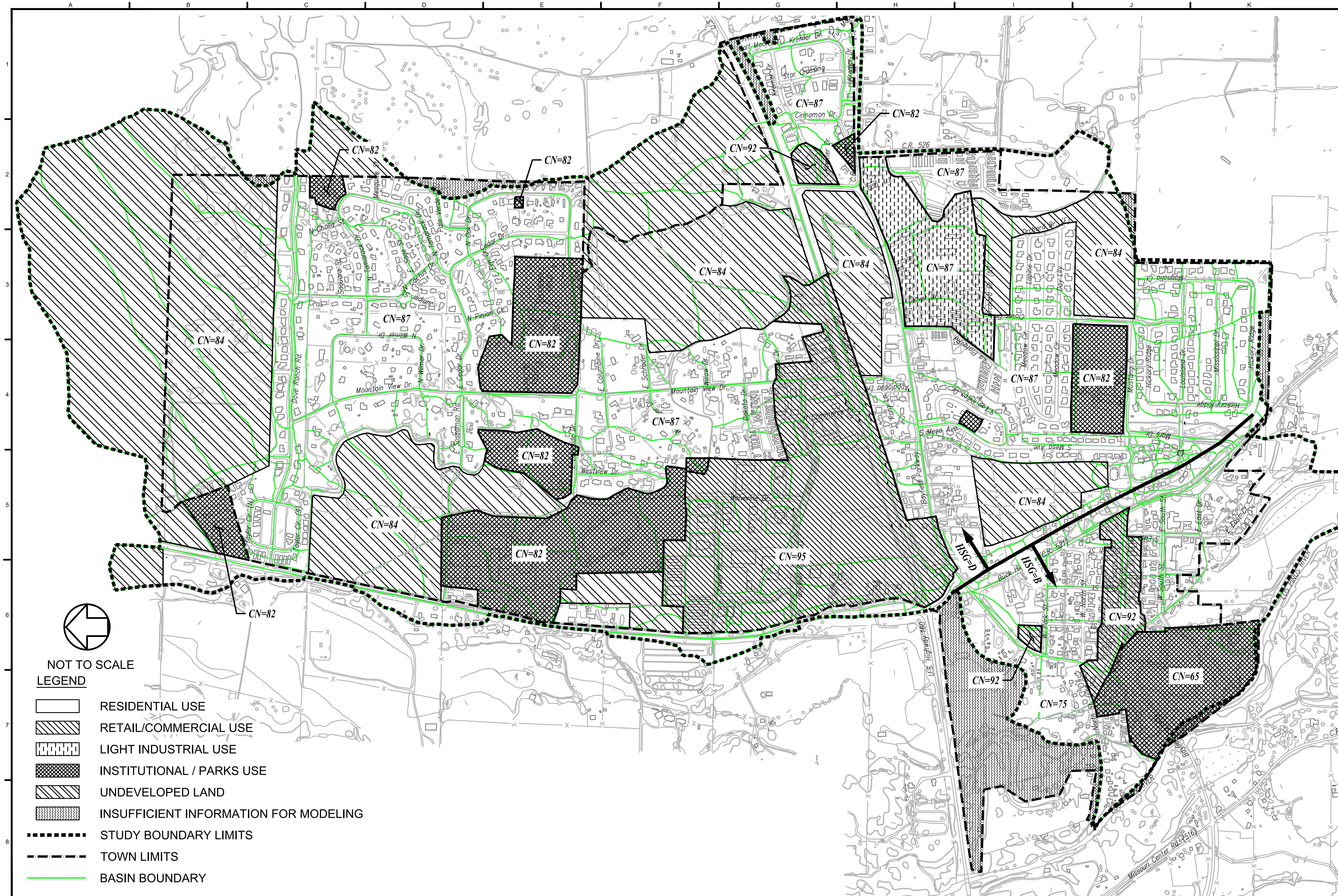

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TOWN OF BAYFIELD
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MASTER DRAINAGE PLAN
LAND USE MAP

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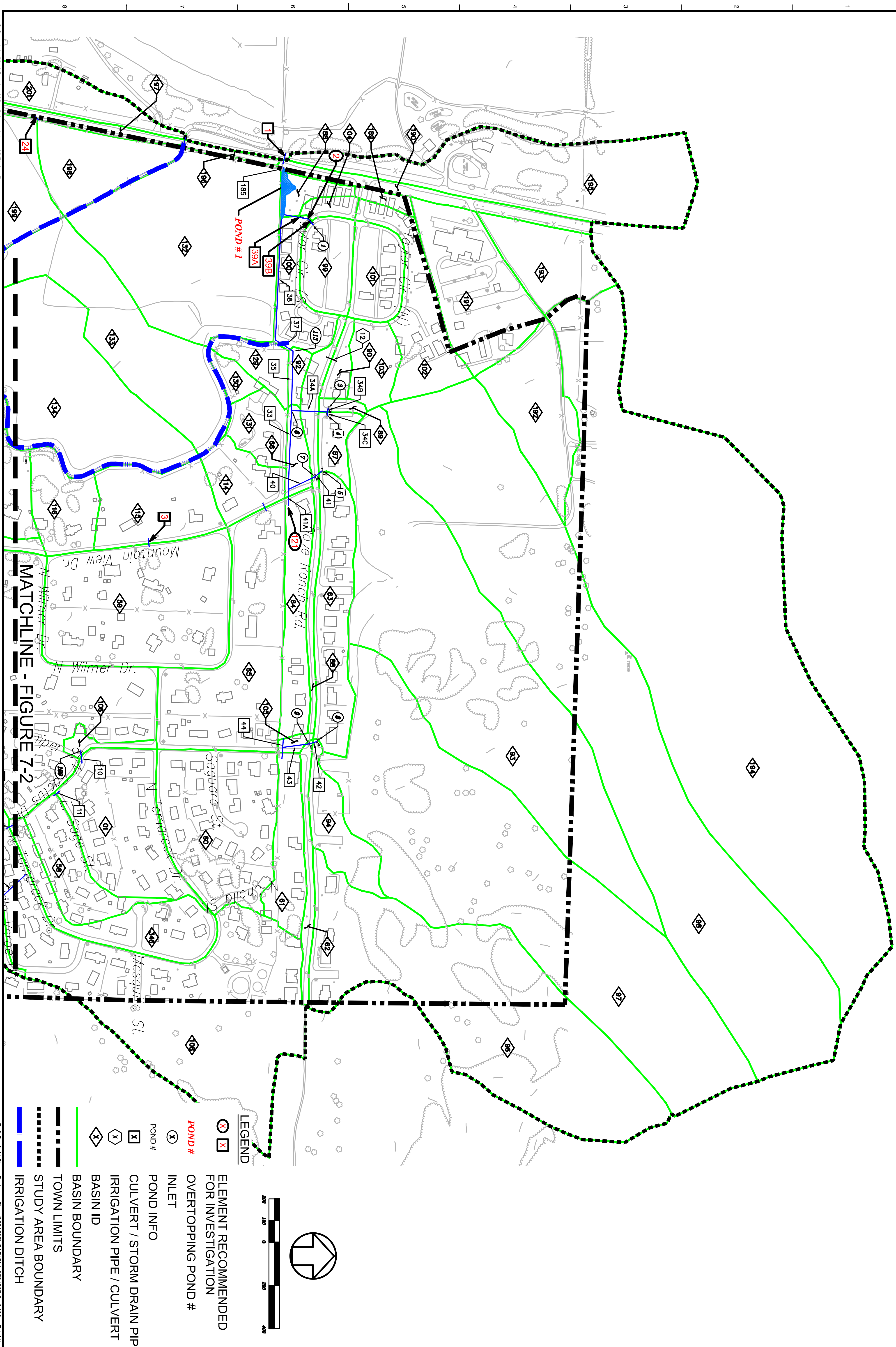

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MASTER DRAINAGE PLAN
ELEMENTS RECOMMENDED FOR INVESTIGATION
5 - YEAR STORM EVENT

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Sheet: FIG 6-1

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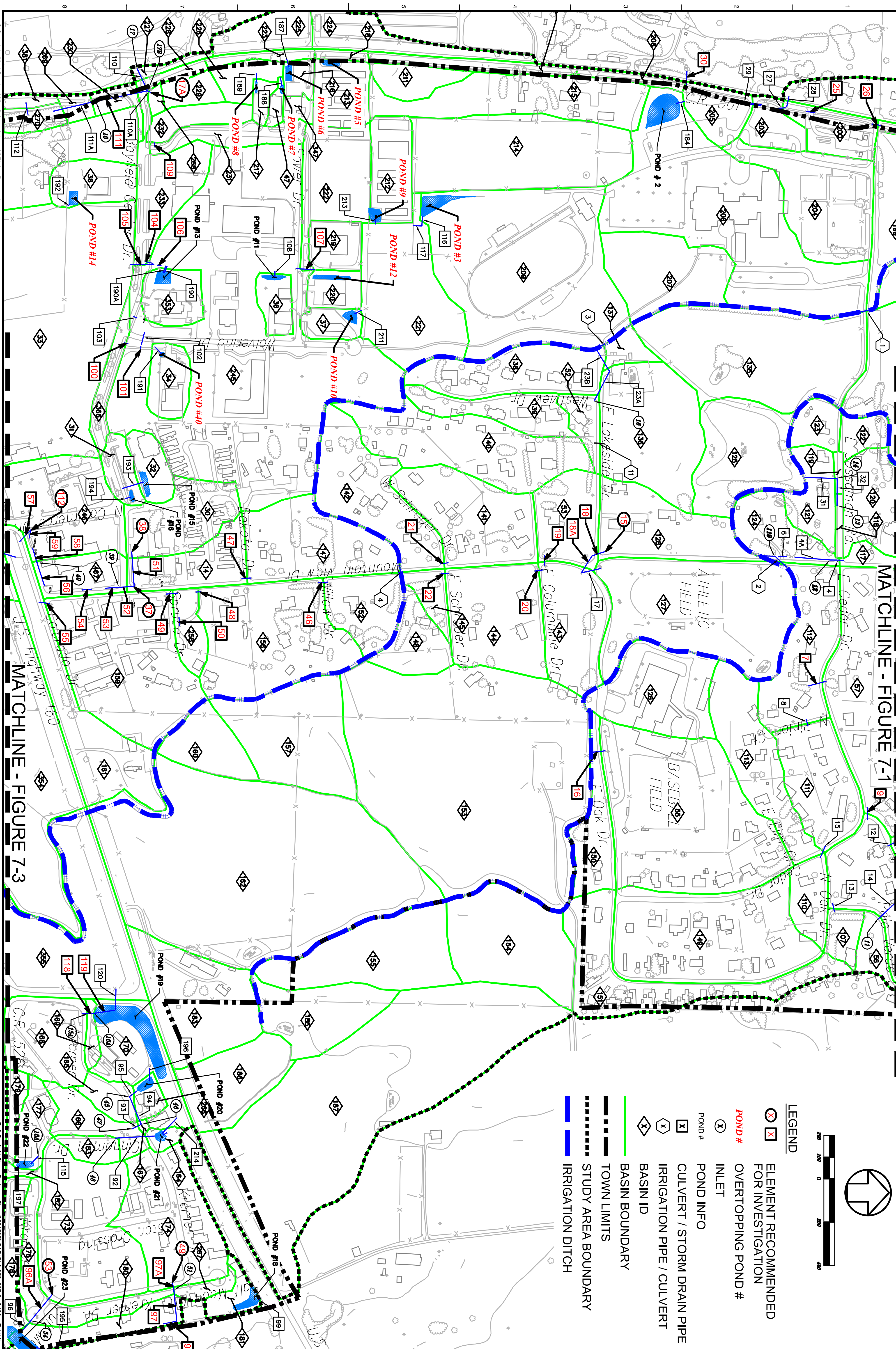

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MASTER DRAINAGE PLAN
ELEMENTS RECOMMENDED FOR INVESTIGATION
5 - YEAR STORM EVENT

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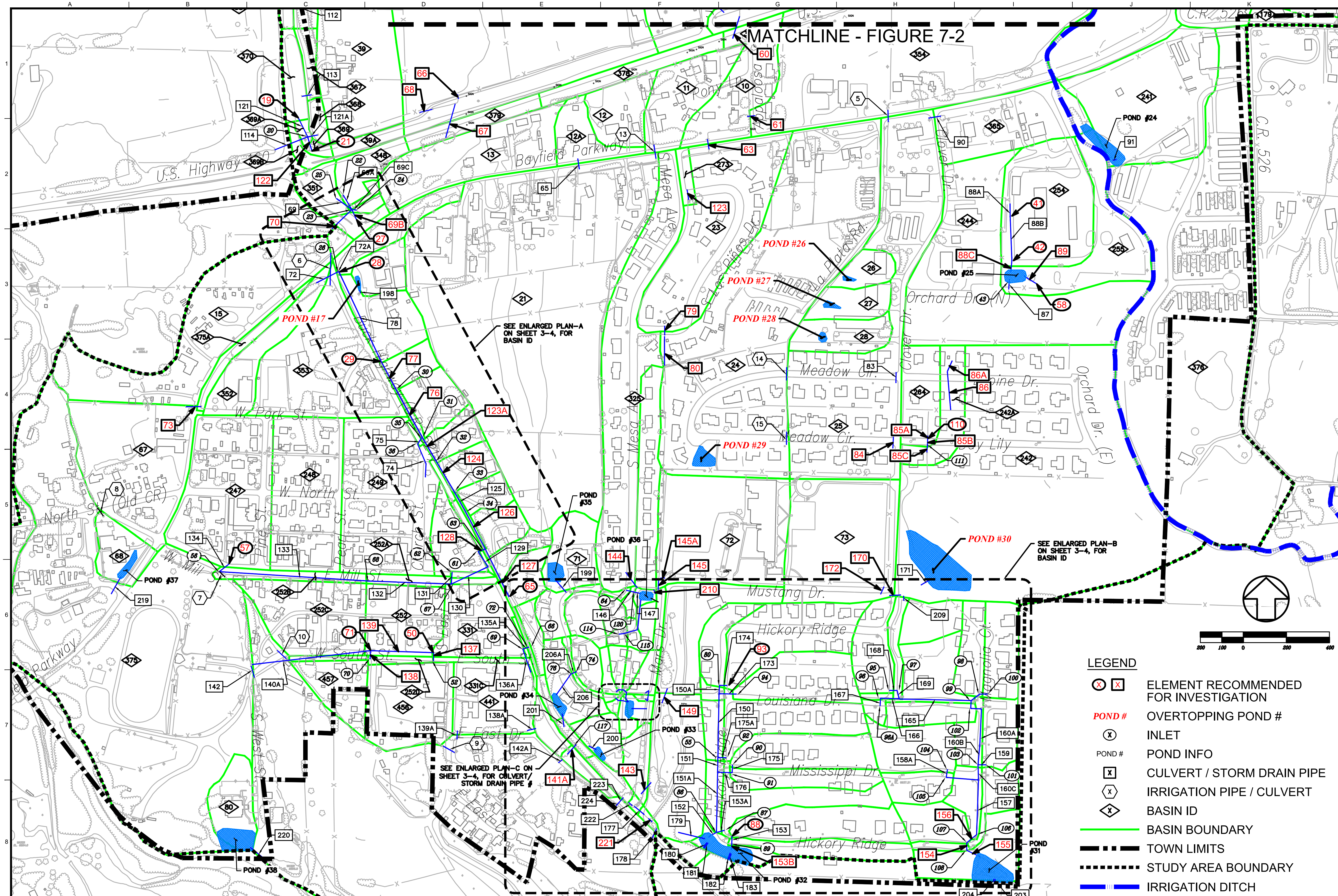

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5 - YEAR STORM EVENT

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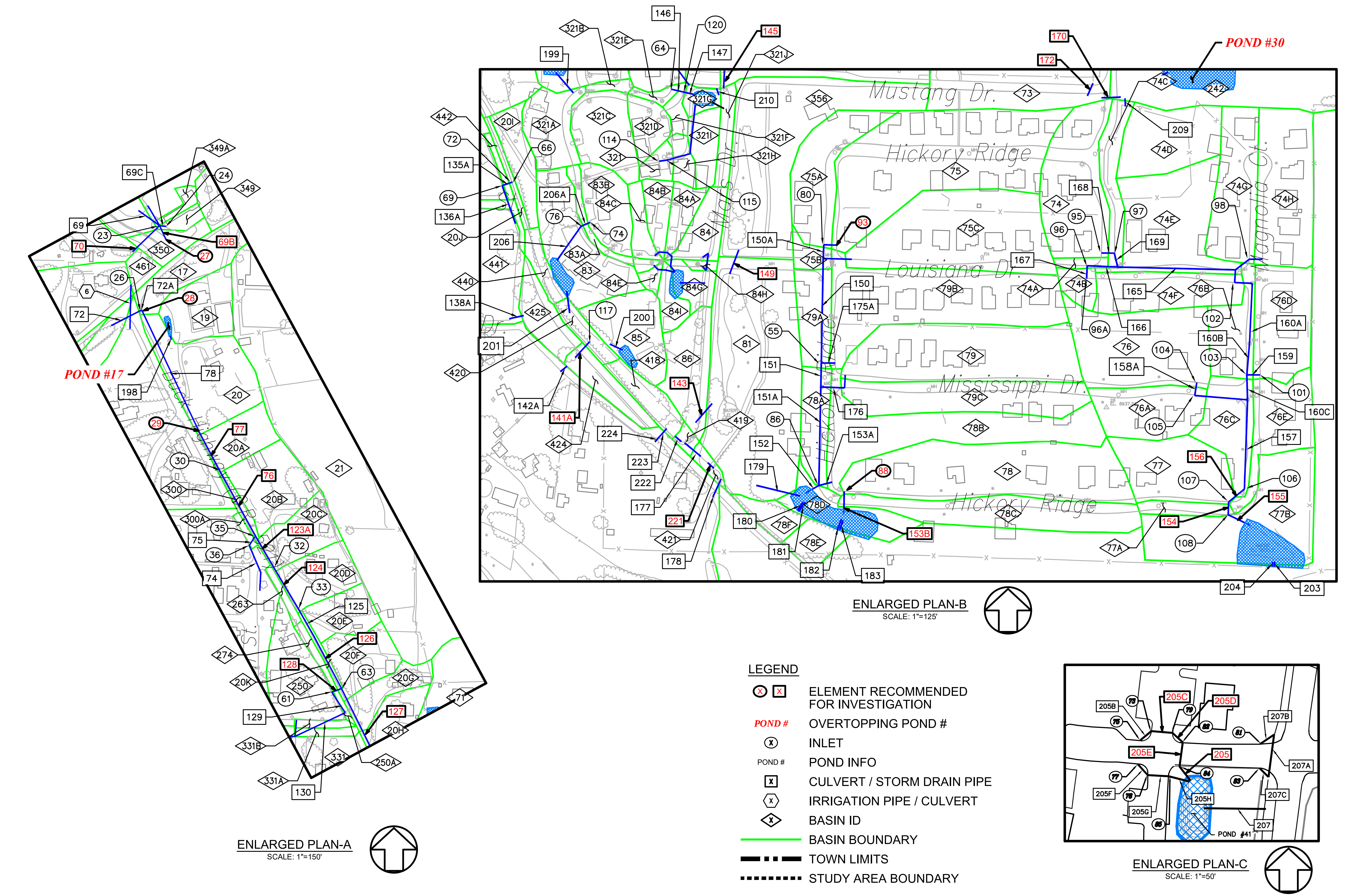

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ELEMENTS RECOMMENDED FOR INVESTIGATION
5 - YEAR STORM EVENT

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Project No: 9521537

Sheet: FIG 6-4

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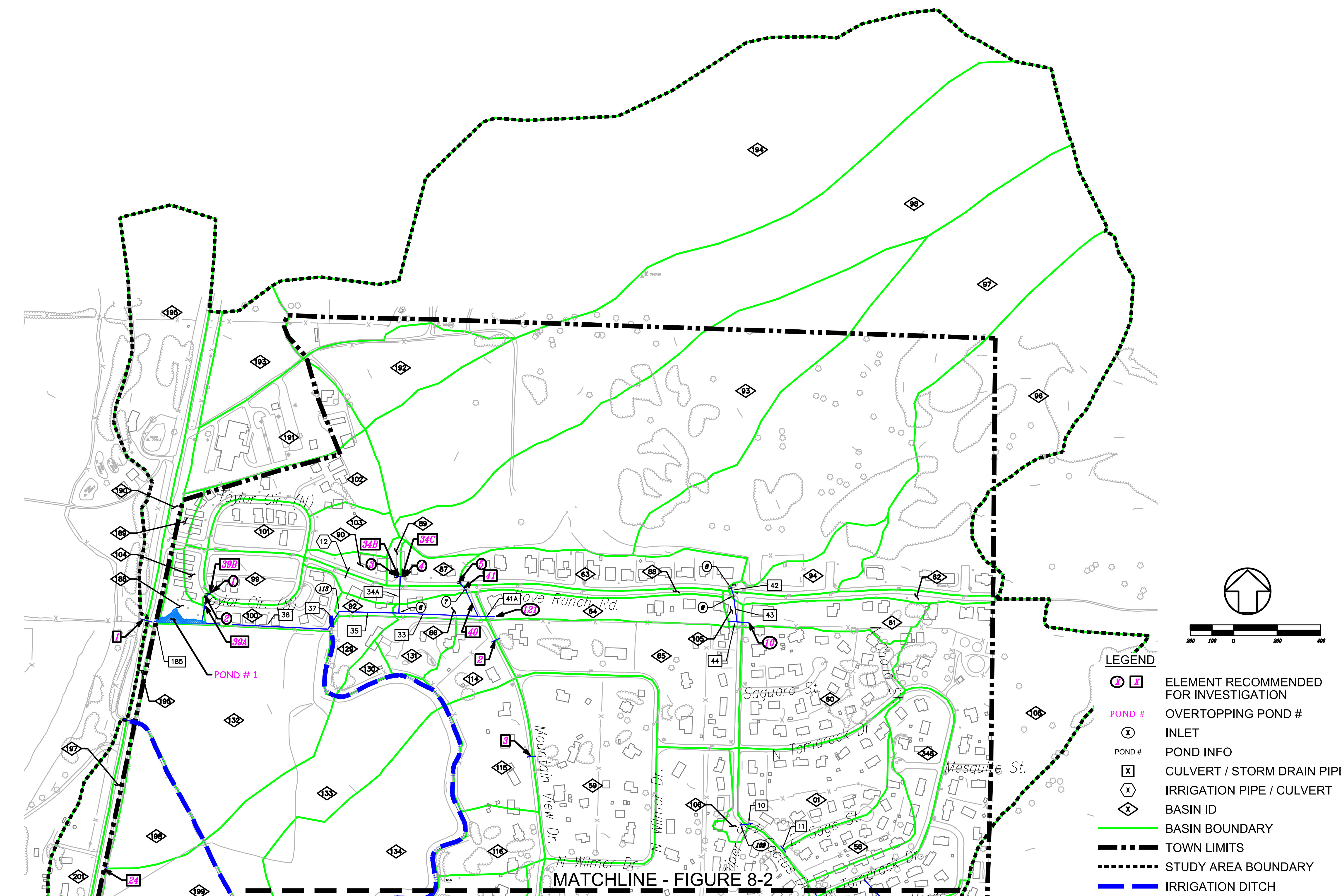

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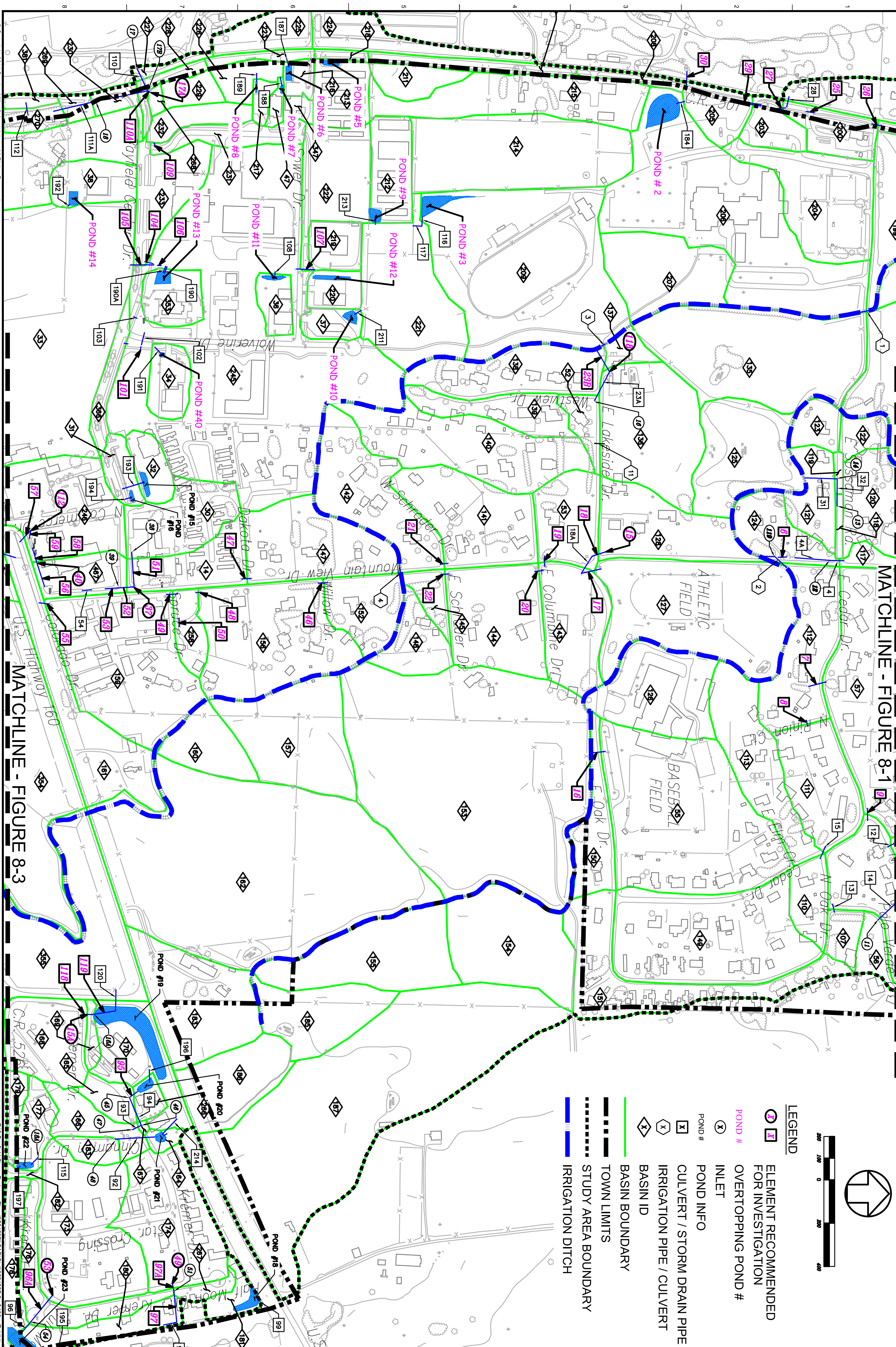
TOWN OF BAYFIELD — BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
ELEMENTS RECOMMENDED FOR INVESTIGATION
100 - YEAR STORM EVENT

THIS DRAWING IS INCOMPLETE AND NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS STAMPED, SIGNED AND DATED

Designed	Drawn	Checked
RLM	DJB	BAA

Date: JUNE, 2014
Scale: Horiz: 1"=200' Vert: N/A
Project No: 9521537
Sheet: FIG 7-1



TOWN OF BAYFIELD | BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
ELEMENTS RECOMMENDED FOR INVESTIGATION
100 - YEAR STORM EVENT

SOUDER, MILLER & ASSOCIATES
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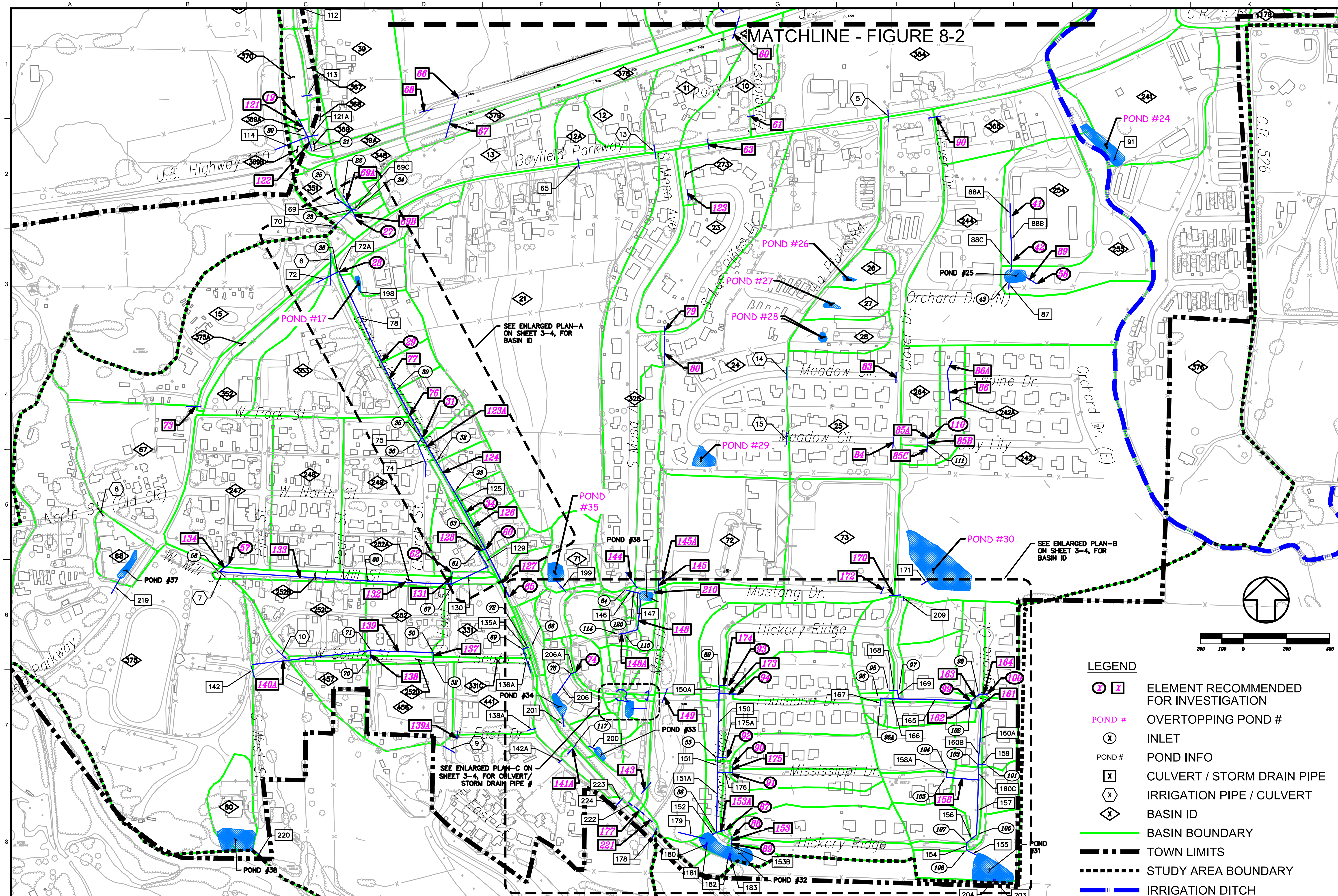
RLM	DJB	BAA

Date: JUNE, 2014
Scale: Horiz: 1"=200' Vert: N/A
Project No: 9521537
Sheet: FIG 7-2

Rev #	Date	Description	By	Chk'd

P:\9-Bayfield Storm Drainage Plan (9521537)\CAD\Civil\9521537-5yr&100yr-Exhibits.dwg , 12/9/2014 4:23:02 PM djb



LEGEND

X (circled) / X (boxed), magenta	ELEMENT RECOMMENDED FOR INVESTIGATION
POND # (magenta)	OVERTOPPING POND #
X (circled)	INLET
POND #	POND INFO
X (boxed)	CULVERT / STORM DRAIN PIPE
X (hexagon)	IRRIGATION PIPE / CULVERT
X (diamond)	BASIN ID
green line	BASIN BOUNDARY
dash-dot line	TOWN LIMITS
dotted line	STUDY AREA BOUNDARY
blue line	IRRIGATION DITCH

TOWN OF BAYFIELD

BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
ELEMENTS RECOMMENDED FOR INVESTIGATION
100 - YEAR STORM EVENT

SMA Engineering • Environmental Surveying

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Designed	Drawn	Checked
RLM	DJB	BAA

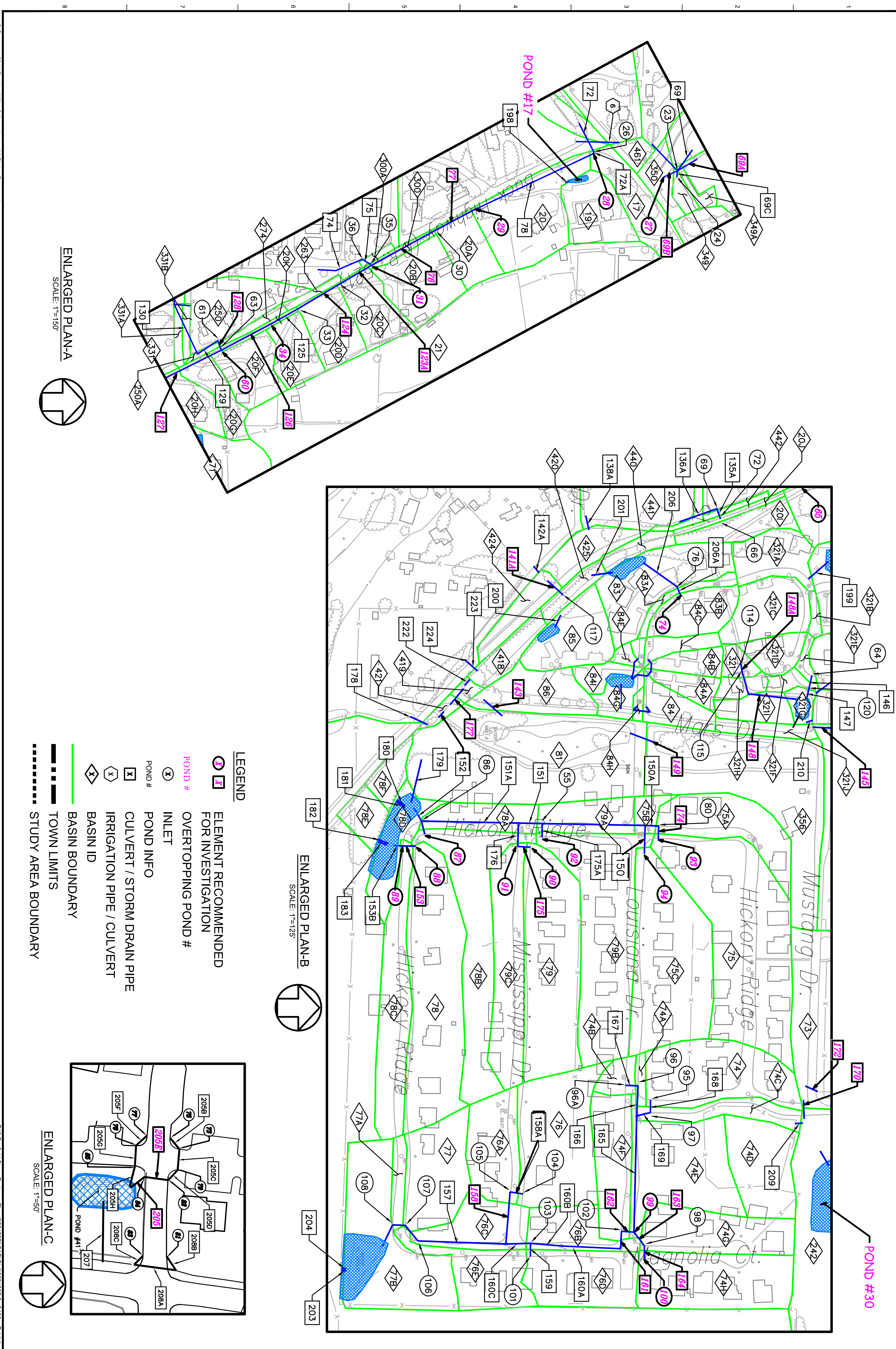
Date: JUNE, 2014

Scale: Horiz: 1"=200' Vert: N/A

Project No: 9521537

Sheet: FIG 7-3

P:\9-Bayfield Storm Drainage Plan (9521537)\CAD\Civil\9521537-5yr&100yr-Exhibits.dwg , 12/9/2014 4:27:46 PM djb



TOWN OF BAYFIELD

BAYFIELD, COLORADO

MASTER DRAINAGE PLAN
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Rev #	Date	Description	By	Chk'd

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Designed	Drawn	Checked
RLM	DJB	BAA

Date: JUNE, 2014

Scale: Horiz: AS NOTED Vert: N/A

Project No: 9521537

Sheet: FIG 7-4

P:\9-Bayfield Storm Drainage Plan (9521537)\CAD\Civil\9521537-5yr&100yr-Exhibits.dwg , 12/9/2014 4:32:03 PM djb

Appendices

Appendix A

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988 (NAVD88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-2, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by La Plata GIS Department. These data are current as of 2009.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study Report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study Report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA Map (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.

La Plata County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)
Animas River	4.2
Hermosa Creek	4.2
Junction Creek	4.1
Dry Gulch Creek	4.0
Lightner Creek	4.1

Example: To convert Animas River elevations to NAVD 88, 4.2 feet were added to the NGVD 29 elevations.

Panel Location Map

This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 34 NORTH, RANGE 07 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~ Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A —— A Cross section line
23 - - - - 23 Transect line
97° 07' 30.00" 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{42}75^{000m}$N 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, south zone (FIPSZONE 0503), Lambert Conformal Conic Projection
DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 19, 2010

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0751F

FIRM
FLOOD INSURANCE RATE MAP
LA PLATA COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 0751 OF 1025

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
BAYFIELD, TOWN OF	080098	0751	F
LA PLATA COUNTY	080097	0751	F

Notice to User: The **Map Number** shown below should be used when placing map orders: the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 08067C0751F

EFFECTIVE DATE: AUGUST 19, 2010

Federal Emergency Management Agency

Appendix B

DURANGO, COLORADO (052432)

1981-2010 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	39.9	46.4	53.1	62.6	71.3	82.7	86.6	84.1	76.1	64.4	49.6	41.0	63.3
Average Min. Temperature (F)	11.4	18.0	24.3	30.5	36.6	44.0	50.8	50.1	42.3	31.9	21.8	14.3	31.4
Average Total Precipitation (in.)	1.30	1.28	1.77	1.47	1.03	0.95	2.34	2.65	2.42	2.23	1.93	1.72	21.10

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1981-2010 period. Smoothing, missing data and observation-time changes may cause these 1981-2010 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

Western Regional Climate Center, wrcc@dri.edu

IGNACIO 1 N, COLORADO (054250)

1981-2010 Monthly Climate Summary

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	40.3	46.5	53.9	62.2	71.9	82.9	87.2	84.6	76.4	64.9	49.7	42.0	63.7
Average Min. Temperature (F)	8.7	15.3	22.6	27.9	35.0	42.4	50.0	48.9	40.9	31.0	20.7	12.0	29.7
Average Total Precipitation (in.)	1.10	1.13	1.36	0.90	0.76	0.57	1.18	1.75	1.84	1.32	1.50	1.36	14.77

Unofficial values based on averages/sums of smoothed daily data. Information is computed from available daily data during the 1981-2010 period. Smoothing, missing data and observation-time changes may cause these 1981-2010 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

Western Regional Climate Center, wrcc@dri.edu

Appendix C

Photo 1 – Inlet – Single,18-inch, w/Capture Vane

Photo 2 – Inlet – Single, 2-Ft Diameter, w/Parallel Openings

Photo 3 – Inlet – Single, 3-Ft Standard Cast iron (CI), w/Capture Vanes, and a 2-Ft Diameter, Round/Circular, w/Parallel Vanes in a sump configuration

Photo 4 – Inlet – Single, 3-Ft Standard Cast Iron, (CI) w/Capture Vanes


Photo 5 – Inlet – Single, 2-Ft X 3-Ft, Parallel Vane in a Sump Configuration


Photo 6 – Inlet – Single, 3-Ft Standard Cast Iron (CI), w/Parallel Vanes

Photo 7 – Inlet – Double, 3-Ft Standard Cast iron (CI), w/Slanted/Angled Vanes

Photo 8 – Inlet – Triple, 3-Ft Standard Cast Iron (CI), w/Slanted/Angled Vanes

Appendix D


Photo 9 – Pond 1 – Outlet Pipe Near Top of Pond Rim – Debris in Front of Outlet Pipe


Photo 10 – Pond 2 – Outlet Structure, Vegetation Obstructing Flow to Structure


Photo 11 – Pond 3 – Cattails and other Vegetation on Ponding Area


Photo 12 – Pond 6 – Outlet Pipe Obstructed


Photo 13 – Pond 7 - Outlet Pipe Obstructed


Photo 14 – Pond 8 – Outlet Pipe/Weir

Photo 15 – Pond 9 –Heavily Silted with Significant Vegetation Growth, Outlet Pipe Located Approximately Near Center of Pond, Overgrown

Photo 16 – Pond 10 - Heavily Silted with Significant Vegetation Growth, Outlet Pipe Silted Over/Not Visible

Photo 17 – Pond 10 - Heavily Silted with Significant Vegetation Growth, Outlet Pipe Silted Over/Not Visible, Pond Spills Over Into Adjacent Property

Photo 18 – Pond 11 – Outlet Structure, Containment Berm is at Approximately Same Elevation as Top of Outlet Structure

Photo 19 – Pond 18 – Outlet Pipe Near Top of Containment Berm and Appears to be Heavily Silted

Photo 20 – Pond 21 – Pond is Heavily Silted, Outlet pipe Not Visible, Significant Vegetative Growth


Photo 21 – Pond 23 – Outlet Pipe


Photo 22 – Pond 24 – Outlet Pipe discharges into Irrigation Canal


Photo 23 – Pond 25 – Inlet Pipe Obstructed


Photo 24 – Pond 25 – Pond Outlet Pipe Silted, Pond is Silted w/Heavy Vegetative Growth


Photo 25 – Pond 25 – Outlet Pipe


Photo 26 – Pond 26 – Heavily Silted, Debris and Vegetation in Pond


Photo 27 – Pond 27 – Heavily Silted w/Vegetative Growth

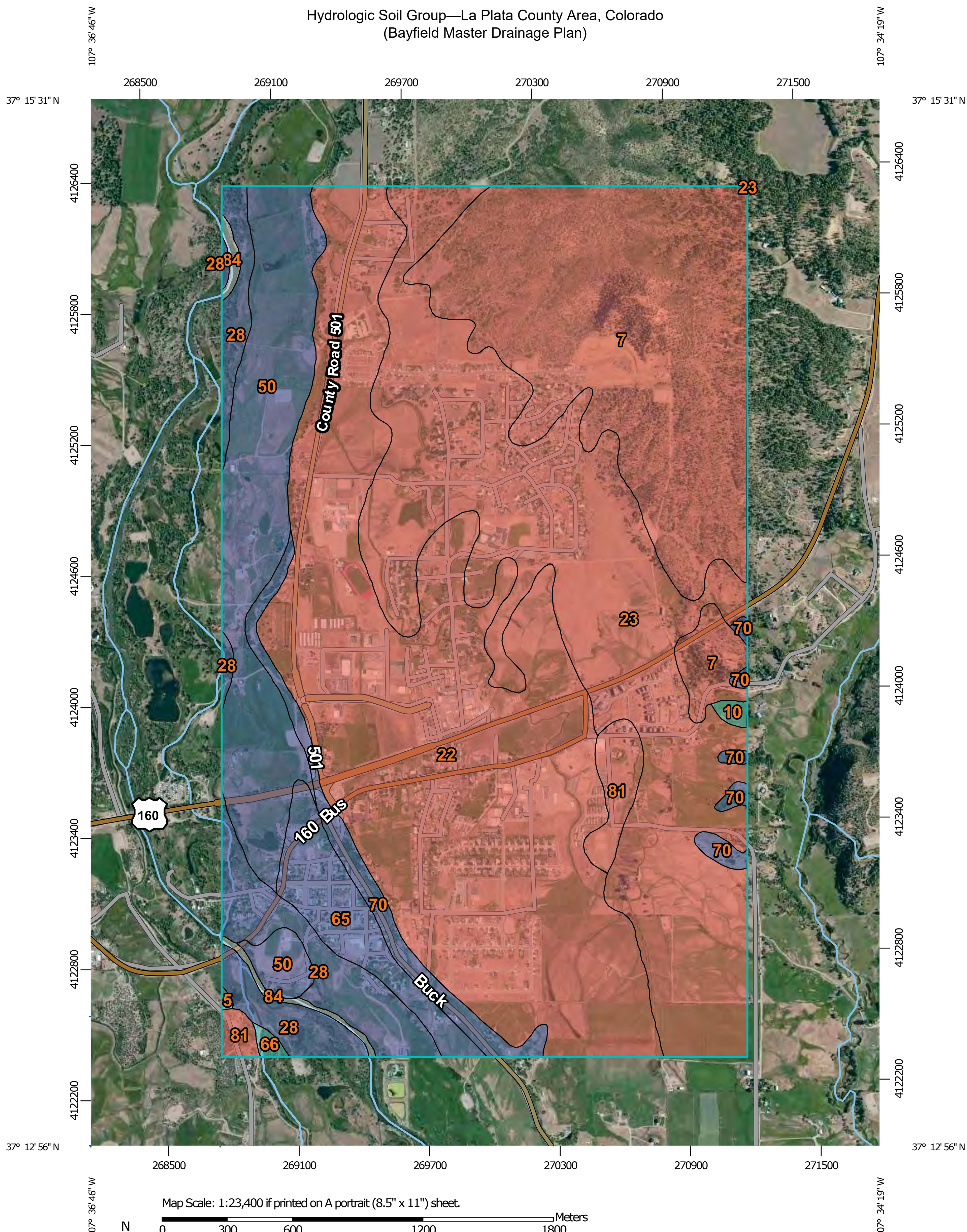

Photo 28 – Pond 28 - Heavily Silted w/Vegetative Growth


Photo 29 – Pond 34 – Vegetative Growth, Including trees and Debris


Photo 30 – Pond 41 – Outlet Pipe

Appendix E

Hydrologic Soil Group—La Plata County Area, Colorado
(Bayfield Master Drainage Plan)



Map Scale: 1:23,400 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 300 600 1200 1800

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: La Plata County Area, Colorado
Survey Area Data: Version 11, Dec 23, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 8, 2011—Sep 22, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — La Plata County Area, Colorado (CO669)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
5	Arboles clay, 3 to 12 percent slopes	C	1.0	0.0%
7	Archuleta-Sanchez complex, 12 to 65 percent slopes	D	467.3	19.6%
10	Bayfield silty clay loam, 1 to 3 percent slopes	C	3.8	0.2%
22	Corta loam, 1 to 3 percent slopes	D	767.5	32.1%
23	Corta loam, 3 to 8 percent slopes	D	606.0	25.4%
28	Fluvaquents, sandy, frequently flooded	B	129.2	5.4%
50	Pescar fine sandy loam	B	235.6	9.9%
65	Sycle fine sandy loam	B	67.9	2.8%
66	Tefton loam	C	3.5	0.1%
70	Ustic Torriorthents-Ustollic Haplargids complex, 12 to 60	B	64.2	2.7%
81	Zyme clay loam, 3 to 25 percent slopes	D	33.9	1.4%
84	Water		9.9	0.4%
Totals for Area of Interest			**2,389.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Appendix F

NOAA Atlas 14, Volume 8, Version 2
Location name: Bayfield, Colorado, US*
Latitude: 37.2332°, Longitude: -107.5929°
Elevation: 6968 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.184 (0.145-0.239)	0.228 (0.179-0.296)	0.313 (0.246-0.408)	0.396 (0.309-0.517)	0.527 (0.406-0.730)	0.642 (0.479-0.890)	0.769 (0.554-1.09)	0.910 (0.630-1.31)	1.12 (0.742-1.63)	1.29 (0.827-1.88)
10-min	0.269 (0.212-0.349)	0.334 (0.263-0.434)	0.459 (0.360-0.598)	0.579 (0.452-0.758)	0.771 (0.594-1.07)	0.940 (0.702-1.30)	1.13 (0.812-1.59)	1.33 (0.922-1.92)	1.63 (1.09-2.39)	1.88 (1.21-2.75)
15-min	0.328 (0.258-0.426)	0.407 (0.320-0.529)	0.559 (0.438-0.729)	0.707 (0.551-0.924)	0.941 (0.724-1.30)	1.15 (0.856-1.59)	1.37 (0.990-1.94)	1.63 (1.13-2.34)	1.99 (1.33-2.92)	2.30 (1.48-3.36)
30-min	0.409 (0.322-0.532)	0.521 (0.410-0.677)	0.727 (0.570-0.947)	0.921 (0.718-1.20)	1.22 (0.936-1.68)	1.48 (1.10-2.04)	1.76 (1.27-2.48)	2.07 (1.43-2.97)	2.51 (1.67-3.67)	2.88 (1.85-4.21)
60-min	0.459 (0.362-0.597)	0.627 (0.493-0.816)	0.914 (0.716-1.19)	1.16 (0.906-1.52)	1.52 (1.15-2.07)	1.81 (1.34-2.48)	2.12 (1.51-2.95)	2.43 (1.67-3.46)	2.87 (1.90-4.17)	3.22 (2.07-4.71)
2-hr	0.510 (0.406-0.652)	0.734 (0.584-0.940)	1.10 (0.874-1.41)	1.41 (1.11-1.81)	1.82 (1.39-2.41)	2.15 (1.60-2.87)	2.47 (1.78-3.37)	2.80 (1.94-3.89)	3.23 (2.16-4.60)	3.56 (2.33-5.13)
3-hr	0.555 (0.446-0.705)	0.806 (0.647-1.02)	1.21 (0.966-1.54)	1.53 (1.22-1.96)	1.97 (1.51-2.57)	2.30 (1.72-3.03)	2.62 (1.90-3.52)	2.93 (2.05-4.03)	3.34 (2.25-4.69)	3.64 (2.40-5.19)
6-hr	0.746 (0.607-0.933)	0.977 (0.794-1.22)	1.35 (1.10-1.69)	1.66 (1.34-2.09)	2.08 (1.61-2.67)	2.39 (1.82-3.11)	2.71 (2.00-3.59)	3.03 (2.15-4.10)	3.44 (2.36-4.76)	3.75 (2.51-5.26)
12-hr	1.04 (0.853-1.27)	1.23 (1.01-1.51)	1.54 (1.27-1.90)	1.81 (1.48-2.24)	2.19 (1.74-2.79)	2.49 (1.93-3.20)	2.79 (2.10-3.66)	3.11 (2.25-4.16)	3.54 (2.47-4.83)	3.86 (2.63-5.34)
24-hr	1.35 (1.13-1.64)	1.52 (1.27-1.84)	1.80 (1.50-2.19)	2.05 (1.70-2.50)	2.41 (1.94-3.02)	2.70 (2.13-3.42)	3.00 (2.30-3.87)	3.32 (2.45-4.38)	3.76 (2.68-5.07)	4.11 (2.85-5.59)
2-day	1.61 (1.37-1.92)	1.84 (1.55-2.19)	2.20 (1.86-2.63)	2.51 (2.10-3.01)	2.92 (2.38-3.59)	3.25 (2.59-4.03)	3.57 (2.76-4.51)	3.90 (2.91-5.03)	4.34 (3.13-5.72)	4.67 (3.29-6.24)
3-day	1.80 (1.54-2.13)	2.05 (1.75-2.42)	2.45 (2.08-2.90)	2.79 (2.36-3.31)	3.24 (2.66-3.94)	3.60 (2.89-4.41)	3.95 (3.08-4.94)	4.30 (3.24-5.49)	4.77 (3.47-6.23)	5.13 (3.64-6.78)
4-day	1.96 (1.68-2.30)	2.22 (1.90-2.60)	2.65 (2.26-3.11)	3.00 (2.55-3.54)	3.49 (2.88-4.21)	3.87 (3.13-4.71)	4.24 (3.33-5.27)	4.63 (3.50-5.86)	5.13 (3.76-6.65)	5.51 (3.95-7.24)
7-day	2.30 (2.00-2.67)	2.61 (2.26-3.02)	3.11 (2.68-3.60)	3.52 (3.03-4.10)	4.09 (3.41-4.86)	4.52 (3.70-5.44)	4.96 (3.94-6.07)	5.40 (4.14-6.75)	5.98 (4.44-7.64)	6.42 (4.66-8.31)
10-day	2.60 (2.27-2.99)	2.93 (2.56-3.37)	3.48 (3.03-4.00)	3.93 (3.40-4.53)	4.54 (3.82-5.35)	5.01 (4.14-5.97)	5.49 (4.40-6.66)	5.96 (4.61-7.38)	6.59 (4.93-8.34)	7.06 (5.17-9.06)
20-day	3.46 (3.07-3.91)	3.84 (3.40-4.34)	4.47 (3.94-5.05)	4.98 (4.38-5.65)	5.68 (4.85-6.58)	6.22 (5.22-7.29)	6.76 (5.51-8.06)	7.30 (5.74-8.88)	8.01 (6.10-9.96)	8.55 (6.37-10.8)
30-day	4.14 (3.70-4.63)	4.59 (4.09-5.13)	5.31 (4.73-5.95)	5.90 (5.23-6.63)	6.71 (5.77-7.68)	7.32 (6.18-8.47)	7.92 (6.51-9.34)	8.52 (6.77-10.3)	9.31 (7.16-11.4)	9.90 (7.45-12.3)
45-day	4.95 (4.46-5.47)	5.52 (4.97-6.11)	6.43 (5.77-7.13)	7.17 (6.41-7.97)	8.15 (7.07-9.23)	8.89 (7.57-10.2)	9.61 (7.96-11.2)	10.3 (8.26-12.3)	11.2 (8.70-13.6)	11.9 (9.04-14.6)
60-day	5.60 (5.08-6.15)	6.31 (5.71-6.93)	7.43 (6.71-8.18)	8.33 (7.49-9.20)	9.51 (8.29-10.7)	10.4 (8.90-11.8)	11.2 (9.35-13.0)	12.0 (9.70-14.2)	13.1 (10.2-15.7)	13.8 (10.6-16.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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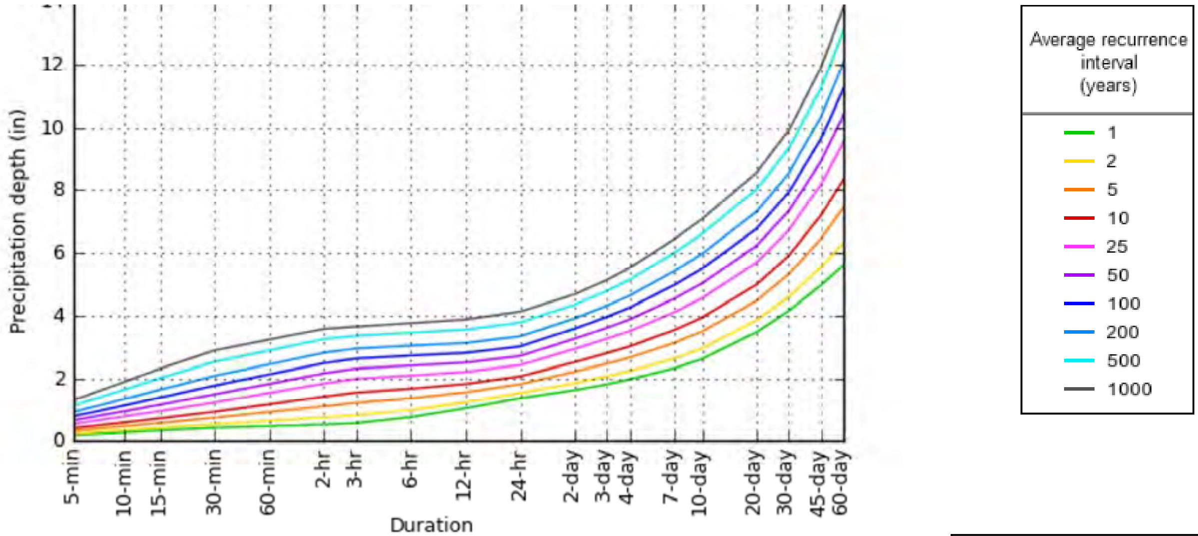
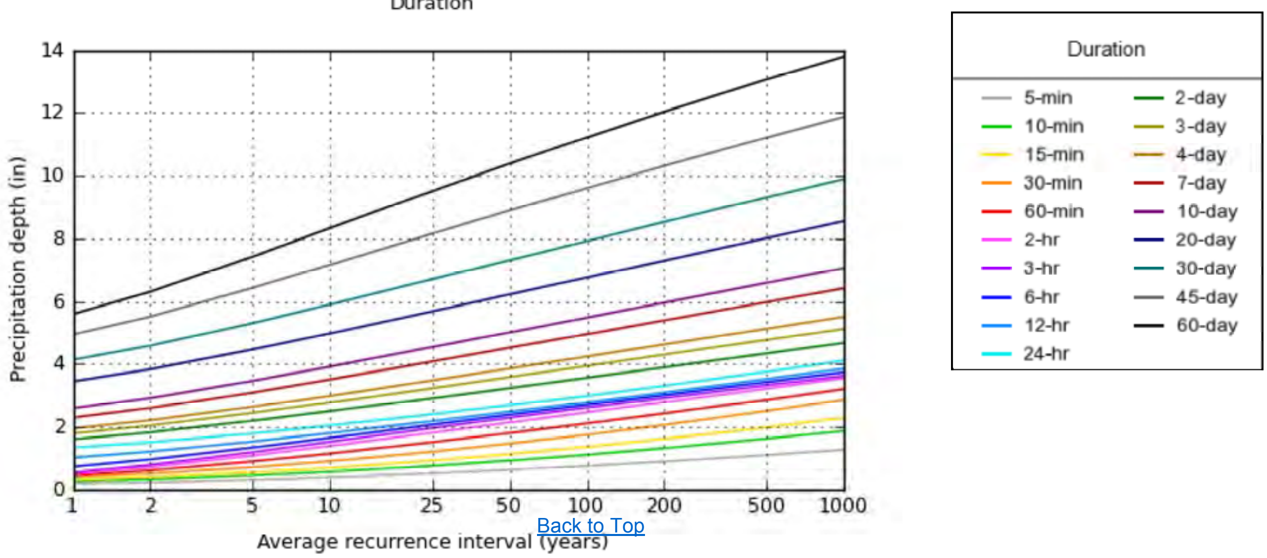
PF graphical





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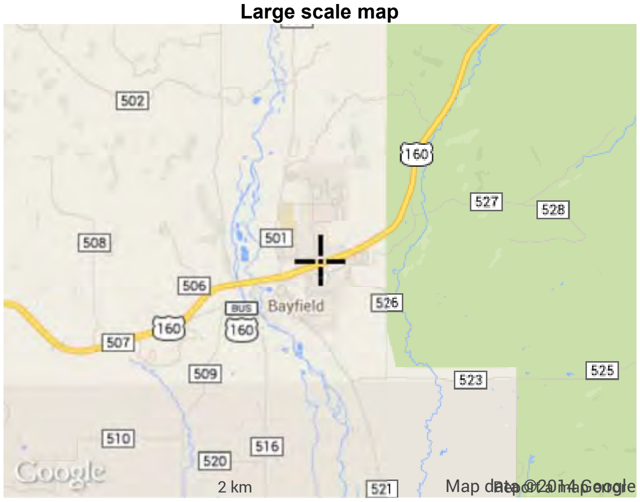
Maps & aerials

Small scale terrain

Large scale terrain

Large scale map



Large scale aerial

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