ALAFIA RIVER WATERSHED MANAGEMENT PLAN

Volume III

Chapters 13 through 16

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CHAPTER 13

ALTERNATIVES ANALYSIS

The major objective of the Alafia River Watershed Management Plan is to develop solutions to the problems identified in the previous sections of this report. This section provides a summary of the problems identified within each individual subwatershed and a discussion of proposed solutions and/or improvements with respect to flood control, water quality, and natural systems.

13.1 Flood Control Alternatives Analysis Methodology

The flooding problems that were identified in Chapter 6 are divided into the following four types: (1) public meeting complaints, (2) historical flood complaints, (3) Hillsborough County Service Unit concerns, and (4) flooding level of service violations.

- **Public Meeting Complaints.** Hillsborough County held open public meetings in October 2000, August 2001, and November 2001 during which the attendees were encouraged to voice any concerns and personal knowledge with respect to flooding problems and issues within the Alafia River Watershed. From these meetings, the information obtained from the County residents was used to compile a geographic dataset of recurrent flood problems. The dataset includes attributes of the flood problem, such as location, possible cause, date of occurrence, and duration of inundation.

- **Historical Flood Complaints.** Hillsborough County was inundated by a series of severe storms in September and December 1997, and February 1998. These storms are collectively referred to as the El Niño Storms. The Hillsborough County Public Works Department received numerous complaints of flooding from County residents and made preliminary efforts to investigate flood and drainage problems during the El Niño Storms. Unfortunately, the Department did not develop an extensive database of these complaints and in many cases recorded only the address of the caller and other minor information. The limited database does not contain detailed backup information required to make meaningful, defensible correlation with the source of the problem. For example, a caller may complain that a road on which they travel is flooded. If the location of the flooded road is not proximate to the caller's address, correlation with the source of the flood problem is not possible. While the utility of these data is limited, they are included in this document and identified as ***historical flood complaints***.

- **Hillsborough County Service Unit Concerns.** The Hillsborough County Public Works Road Maintenance Division is divided into four geographically defined Service Units that perform operation and maintenance tasks for County-owned public works infrastructure, such as roads, culverts, and ditches. Many drainage infrastructure problems are referred to Service Unit personnel to address deficiencies in the drainage system. These County staff are therefore some of the most knowledgeable of flooding problem areas in the County. Parsons staff conducted extensive interviews with Service Unit staff to obtain input as to known flooding problems in the Alafia River Watershed. The results of service

unit interviews are referred to in this document as ***Hillsborough County Service Unit concerns***.

- As previously discussed in Chapter 6, the Stormwater Management Element of the Hillsborough County Comprehensive Plan defines a set of flooding levels of service (LOS) provided by a stormwater facility in terms of the frequency/duration (e.g., 10-year/24-hour) of the rainfall event that a particular facility can accommodate without causing floodwaters to rise above an acceptable level at that facility. The four flood level designations, A, B, C, and D, correspond to the following:

    - Level A – No significant street flooding
    - Level B – No major residential yard flooding
    - Level C – No significant structure flooding
    - Level D – No limitation on flooding

    The term "significant flooding" which is used in the County's Comprehensive Plan is interpreted to refer to flooding which prohibits the use of a roadway by vehicles (i.e. nuisance and minor flooding are not to be included in the definitions of flooding). The LOS definition that has been adopted by the County for use within this analysis establishes the assigned LOS designation based primarily on the road crown elevation, and relates the existence of significant street, yard and/or structure flooding to the depth of flooding of the street. The numerical criteria that were adopted as a means of providing measurable depth definitions of "significant flooding" are listed in the following table. Note the addition of two new LOS designations, D* and O, which were not included within the original County Comprehensive Plan.

Flooding Level of Service	*Hillsborough County Comprehensive Plan Definition*	*Alafia River Watershed Management Plan Definition*
A	No significant street flooding	Street flooding is less than 3" above the crown of road
B	No major residential yard flooding	Street flooding is more than 3" above the crown of road, but less than 6"
C	No significant structure flooding	Street flooding is more than 6" above the crown of road, but less than 12"
D	No limitation on flooding	Street flooding is more than 12" above the crown of road
D*	No limitation on flooding*	Flood elevation is greater than finished floor elevation, and street flooding is less than 12" above the crown of road
O	N/A	No structure and no street to compare with flood elevation

The goal of the County's Watershed Management Planning program is to develop a capital improvement program to improve the flooding level of service for all watersheds from the adopted to either the target or ultimate LOS. The Board of County Commissioners, in the Comprehensive Plan, promulgated the 25-year/24-hour/B flooding level of service as the target level of service for all watersheds within the county. The ultimate LOS standards have not been determined for the major stormwater conveyance

systems located outside of the areas for which completed watershed management plans currently exist. These standards are to be established via the Comprehensive Stormwater Management Master Planning Program, of which this study is a part.

- **Flooding Level of Service Violations**. Hillsborough County's Stormwater Management Model -- developed for this plan -- is run with a series of hypothetical design storms. Model development and results are described in Chapters 5 and 6 of this plan. Public road crown elevations are estimated from Southwest Florida Water Management District topographic maps or design plans. Finished floor elevations are estimated from District maps as one foot above the lowest intersected topographic contour. Finished floor elevations are also collected from design plans. These control elevations are compared with flood elevations generated by the model for the 25-year/24-hour to determine the LOS provided. Those locations that do not attain the County's target level of service ('B' LOS) are referenced in this document as ***flooding level of service violations***.

The model and this level-of-service analysis detail the primary drainage system, and portions of the secondary drainage system. Constituent complaints, more often than not, occur in the tertiary drainage system. The analysis does not identify cases of structural flooding on the tertiary drainage system, or some portions of the secondary drainage system. The primary drainage system includes the creek or river the subwatershed is named for and most secondary drainage systems. The secondary drainage systems include stormwater management ponds and small creeks that drain to the primary system. The tertiary drainage system drains to the secondary system.

As noted, identified flooding problems have been previously identified, mapped, and tabulated in Chapter 6. Unless otherwise noted, all cited water-surface elevations and flood depths are the result of a 25-year storm with a hypothetical rainfall distribution and 24-hour duration. All elevations are in feet, referenced to the National Geodetic Vertical Datum of 1929. The methodology adopted for this study was to consider all flooding problems identified from the four sources of information and evaluate alternatives to resolve them. The list was screened at first to eliminate those problems that, by Hillsborough County policy, are not the responsibility of the County to address. For the most part, these types of flooding problems are those that occur solely within private property where the County has no jurisdiction or County-owned stormwater facilities. Exceptions to this are where it may be considered in the County's and general public's interest to enter onto private land to provide flood relief not only there but also in adjacent public and private properties.

During the screening process, many of the locations of historical flooding complaints were eliminated from further consideration since it could not be determined from the County records what defined the problem or where it occurred. Also, those complaints that could be considered maintenance problems were in some cases referred to a list of recommended maintenance activities (see Chapter 15).

A number of flooding level of service problem areas were identified by modeling results for closed drainage basins. These occurrences were evaluated on an individual basis to determine whether alternative mitigative measures were warranted. The difficulty in these instances is that the model formulation for closed basins does not account for any percolation that occurs over the course of the simulation within these ponded areas. As many of these indicated problem areas are underlain by highly pervious (Type A) soils, model results can be

unreliable. In general, only those areas for which there was correlating evidence of a flooding problem (i.e. historical flooding problems reported from the El Nino events in 1997 and 1998, flooding complaints, or Service Unit reported problems) were considered as candidates for alternatives analyses.

The locations of the flood control alternatives that were addressed once this screening process was completed are shown in Figure 13.1-1. Discussions of the specific problems and alternatives are provided in Section 13.2.

Figure 13.1.1 north (11 x 17 back)

MATCH LINE TO FIGURE 13.1-1 (NORTH)

FIGURE 13.1-1

ALAFIA RIVER WATERSHED FLOOD CONTROL ALTERNATIVE LOCATIONS MAP (SOUTH)

LEGEND

- *AR-1* — *Flood Control Alternative Location*
- *Subwatershed Boundary*
- *Creek*
- *River*
- *County Boundary*

Aerial Source:
1999 USGS DOQQ

N W E S

1 0 1 Miles

HILLSBOROUGH COUNTY
FLORIDA

AR-10 BUCK-6 AR-4 BUCK-4 AR-5 BUCKHORN CREEK ALAFIA RIVER MAIN STEM NORTH PRONG ALAFIA RIVER 676 NICHOLS RD AR-1 AR-8 AR-3 AR-11 AR-7 BELL SHOALS RD AR-9 BOYETTE RD LITHIA RD SP-1 75 41 301 BALM RIVERVIEW RD SP-2 SOUTH PRONG ALAFIA RIVER BELL CREEK FISHHAWK CREEK BELL-1 39 SP-3 672 674

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Figure 13.1.1 south (11 x 17 back)

FIGURE 13.1-1

ALAFIA RIVER WATERSHED FLOOD CONTROL ALTERNATIVE LOCATIONS MAP (NORTH)

LEGEND

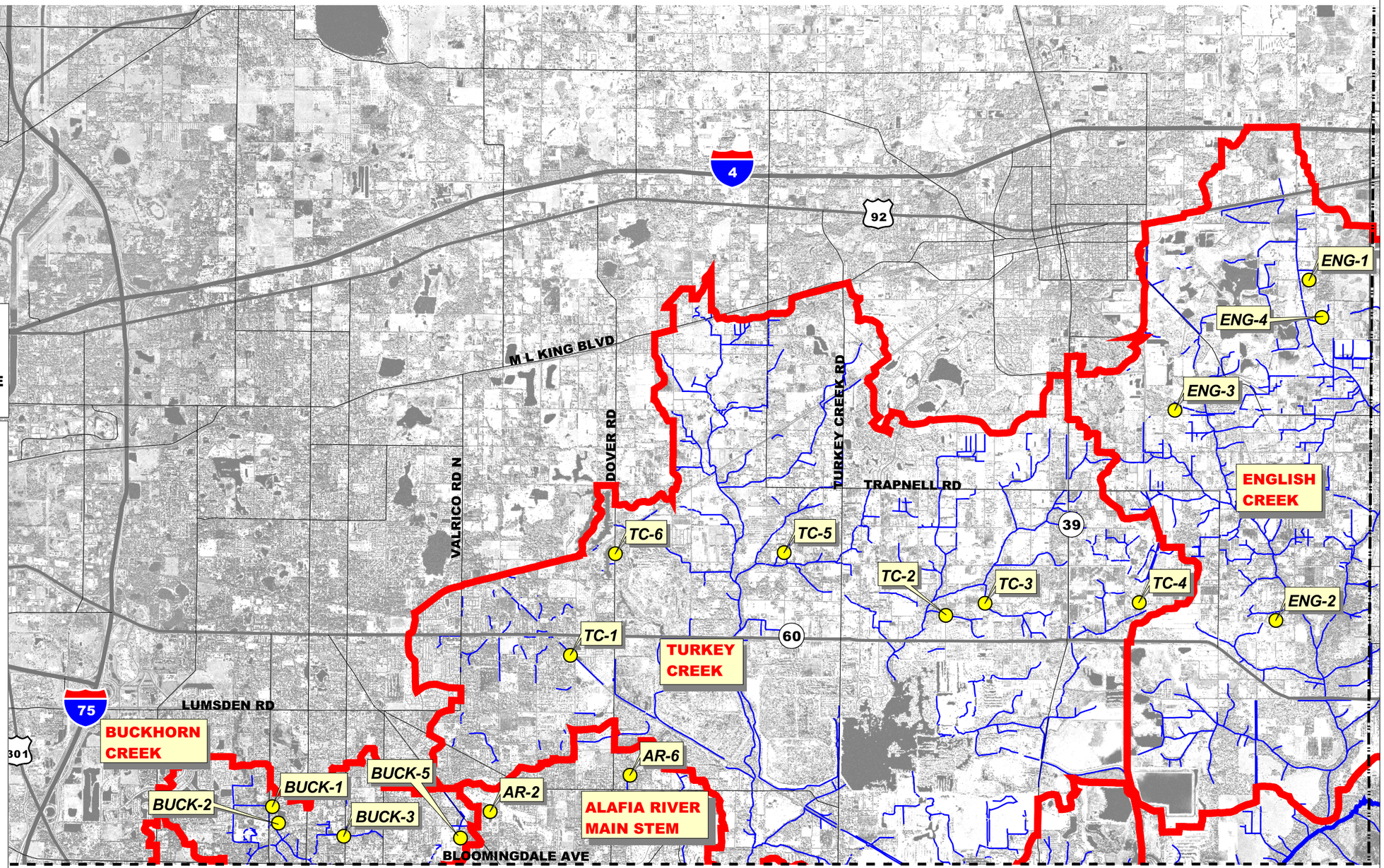
- *AR-1* — *Flood Control Alternative Location*
- *Subwatershed Boundary*
- *Creek*
- *River*
- *County Boundary*

Aerial Source:
1999 USGS DOQQ

N W E S

1 0 1 Miles

HILLSBOROUGH COUNTY
FLORIDA



MATCH LINE TO FIGURE 13.1-1 (SOUTH)

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13.2 Flood Control Alternatives

13.2.1 Buckhorn Creek Subwatershed

As described in Chapter 6, the County's adopted *Ultimate Level of Service* for the Buckhorn Creek Subwatershed is a minimum goal of Level 'B' for the 10-year, 24-hour design storm event. There are seven (7) locations identified within the Buckhorn Creek Subwatershed where the County's minimum acceptable level of service criteria are not met (See Table 6.4-6 and Figure 6.4-3). Of these seven locations, six constitute a LOS deficiency for a Hillsborough County improved public roadway. Two of the six locations, however, lie within closed basins and were disregarded for reasons described earlier in this chapter.

In addition to the LOS deficiency areas that were identified through the modeling of the existing hydrologic and hydraulic conditions, other flooding problem areas were identified based on input received during public meetings or from Hillsborough County Service Unit or historical flooding complaints databases (See Figure 6.4-1). These problem areas were investigated where there was sufficient information provided and alternative measures analyzed. In some cases, further detailed study is needed. In many instances, the problem was related to a maintenance issue and it was added to a list of recommended maintenance needs provided in Chapter 15.

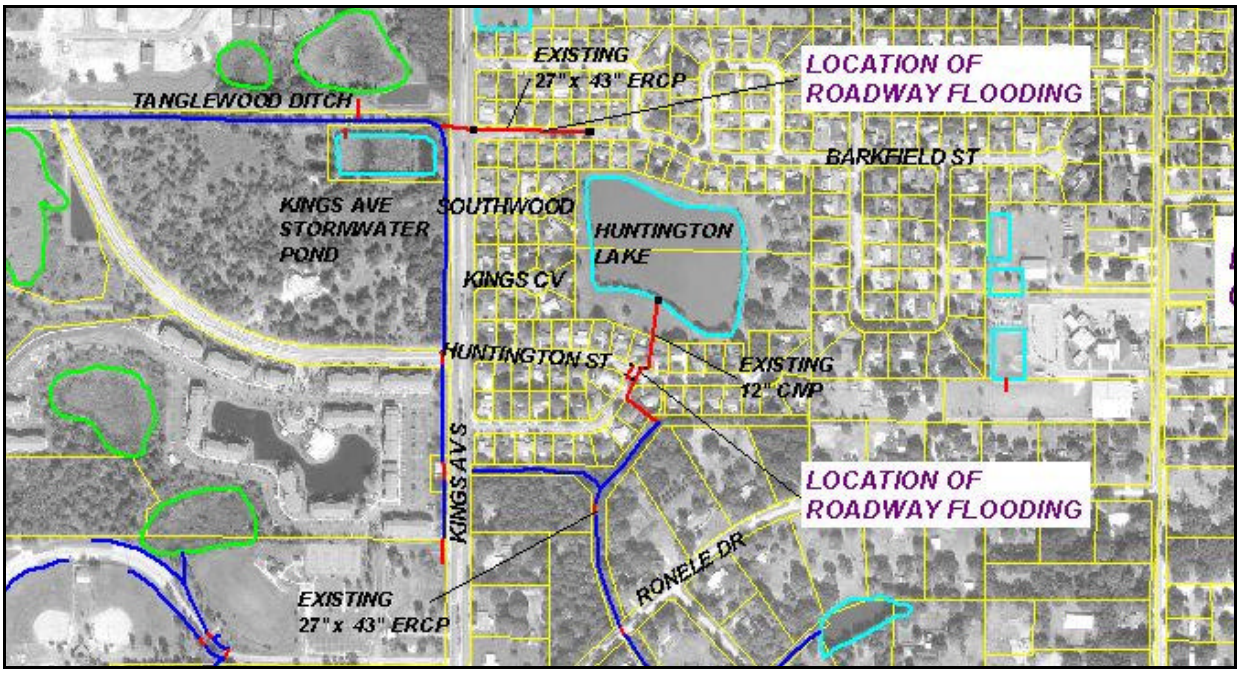
The following discussion details the flooding problems identified in the Buckhorn Creek Subwatershed, and provides a description of the proposed solutions and alternatives. The locations of these projects are shown in Figure 13.1-1.

Problem Areas BUCK-1 and BUCK-2: Barkfield St. and Huntington St.

Problem Definition:

The flooding problems that were identified by model results for Barkfield Street and Huntington Street were addressed simultaneously as a combination of alternatives that act in concert. Barkfield Street experiences chronic flooding up to 3.0 feet deep in the street for the 10-year, 24-hour design storm event due to inadequate outfall capacity. The street (low road elevation approximately 29.7 ft NGVD) is served by an existing 27"x43" CMPA storm sewer outfall to the Tanglewood Ditch, west of Kings Avenue. The capacity of this storm sewer is constrained by the hydraulic inefficiency of the ditch, which is extremely flat, heavily vegetated, and silted. It is possible that the existing pipe is also of diminished capacity due to sediment deposition. The problems at this location were confirmed by local residents who attended the public meetings, and by flood complaint records and Hillsborough County Service Unit staff. Over recent years, house flooding was reported by these sources on several instances.

Huntington Street is flooded by the backwater conditions in Tributary D created by an inadequately sized downstream private drive crossing located just downstream (south) of the storm sewer system outfall and north of Ronele Drive. The existing culvert at this private drive is a 27"x43" CMPA, which creates a head loss of over 2 feet across this structure for the 10-year event. The backwater conditions created at this structure result in flooding conditions in Huntington Street of approximately 0.8 feet.



Buck-1 and Buck 2 Flooding Problem Area Location Map



Barkfield Street on September 14, 2001 (during Tropical Storm Gabrielle)



Sediment and vegetation blocking Tanglewood Ditch west of Kings Avenue at Barkfield Street storm sewer system outfall

Alternative Solutions:

Alternative 1:

Description: This alternative addresses the flooding problems on Barkfield Street through the replacement of 240 LF of the existing storm sewer with a new 32”x49” ERCP storm sewer that connects to the Tanglewood Ditch. For this to achieve an acceptable level of service, it is also required that the Tanglewood Ditch be cleared of the sediment deposits and vegetative growth that has accumulated for a distance of 5750 feet from Kings Avenue to Viola Drive. This is necessary to achieve an acceptable hydraulic efficiency and must be part of a regular maintenance program to ensure a continued performance standard.

Advantages: This alternative requires no additional easement or land purchase and utilizes the existing drainage system to the greatest extent. There are no additional water quality or environmental benefits.

Disadvantages: In addition to the initial capital cost of this alternative, its effectiveness is directly dependent on the continued maintenance of the Tanglewood Ditch, which has not been proven a reliable function. Removal of vegetative growth in the ditch will, to a degree, result in loss of environmental habitat and stormwater treatment functions. This alternative does not address the identified problems on Huntington Street. Environmental permitting for ditch maintenance could become an issue.

Effectiveness: The effectiveness of this alternative is to reduce the 10-year flood elevation on Barkfield Street from 31.34 ft NGVD to 29.00 ft NGVD. Additionally, the

25-year flood elevation is reduced from 32.38 ft NGVD to 30.18 ft NGVD and a 25-year flooding LOS B condition is attained.

Estimated Cost: The initial capital cost of this alternative is estimated at $77,600. This figure does not include the cost of regular continued maintenance of the ditch.

Alternative 2:

Description: This alternative addresses both the flooding problems on Barkfield Street and Huntington Street through the abandonment of the existing Barkfield Street storm sewer and rerouting of street drainage via 200 LF of new 32”x49” ERCP storm sewer that connects southward to Huntington Lake. In addition, the existing 12” CMP lake outfall would be replaced by 300 LF of 19”x30” ERCP and a modified FDOT Type D inlet control structure added to optimize the stormwater detention and treatment capacity of this lake. The control structure would have a 10-foot weir notch with a crest elevation of 26.4 ft NGVD (existing outfall control elevation). Finally, the existing private road culvert on Channel D would be replaced by a 34”x53” ERCP to reduce the flood elevation at Huntington Street to an acceptable level of service.



Existing Huntington Lake 12” CMP Outfall (no control structure)



Private dirt road 27"x43" CMPA crossing of Tributary D downstream of Huntington Lake outfall

Advantages: This alternative addresses both the Barkfield Street and Huntington Street flooding problem areas. By rerouting the Barkfield Street drainage to Huntington Lake, the stormwater runoff from the contributing drainage area would receive treatment that is not currently provided, thus providing water quality benefits. No extreme maintenance activities are required for the Tanglewood Ditch, thus retaining its environmental habitat intact. Environmental permitting for the improvements should not be difficult.

Disadvantages: Drainage easements will be required for the construction and continued maintenance of the new stormwater conveyances, thus the cooperation of affected property owners will be necessary.

Effectiveness: The effectiveness of this alternative is to reduce the 10-year flood elevation on Barkfield Street from 31.34 ft NGVD to 28.39 ft NGVD. Additionally, the 25-year flood elevation is reduced from 32.38 ft NGVD to 29.20 ft NGVD and a 25-year flooding LOS A condition is attained. The flood elevations on Huntington Lake remain the same for both the 10-year and 25-year storm events. For Tributary D, at the Huntington Street storm sewer system outfall, the 10-year flood elevation is reduced by over 1.8 feet, and the 25-year is reduced by 1.0 feet. A 25-year LOS B condition is attained for Huntington Street.

Estimated Cost: The capital cost of this alternative is estimated at $74,500. This figure includes the cost of purchase of drainage easements to construct the new drainage conveyances.

Alternative 3:

Description: This alternative is the same as Alternative 2 in all respects except that the existing 27"x43" CMPA Barkfield Street storm sewer is kept in service in addition to 200 LF of new 29"x45" ERCP storm sewer that connects southward to Huntington Lake. The lake outfall and private road culvert replacements are identical to Alternative 2.

Advantages: This alternative addresses both the Barkfield Street and Huntington Street flooding problem areas. By rerouting the Barkfield Street drainage to Huntington Lake, the stormwater runoff from the contributing drainage area would receive treatment that is not currently provided, thus providing water quality benefits. No extreme maintenance activities are required for the Tanglewood Ditch, thus retaining its environmental habitat intact. Environmental permitting for the improvements should not be difficult.

Disadvantages: Drainage easements will be required for the construction and continued maintenance of the new stormwater conveyances, thus the cooperation of affected property owners will be necessary.

Effectiveness: The effectiveness of this alternative is to reduce the 10-year flood elevation on Barkfield Street from 31.34 ft NGVD to 28.94 ft NGVD. Additionally, the 25-year flood elevation is reduced from 32.38 ft NGVD to 30.28 ft NGVD, thus attaining only a 25-year flooding LOS C condition with this alternative. The flood elevations on Huntington Lake are raised approximately 0.5 feet and 0.3 feet for the 10-year and 25-year storm events, respectively. For Tributary D, at the Huntington Street storm sewer system outfall, the 10-year flood elevation is reduced by 1.1 feet, and the 25-year is reduced by 0.2 feet. A 10-year LOS A condition is attained for Huntington Street. By retaining the connection to the Tanglewood Ditch with this alternative, there is actually a reversal of flow direction from the ditch to Huntington Lake, which detracts from the effectiveness of the improvements.

Estimated Cost: The capital cost of this alternative is estimated at $68,500. This figure includes the cost of purchase of drainage easements to construct the new drainage conveyances.

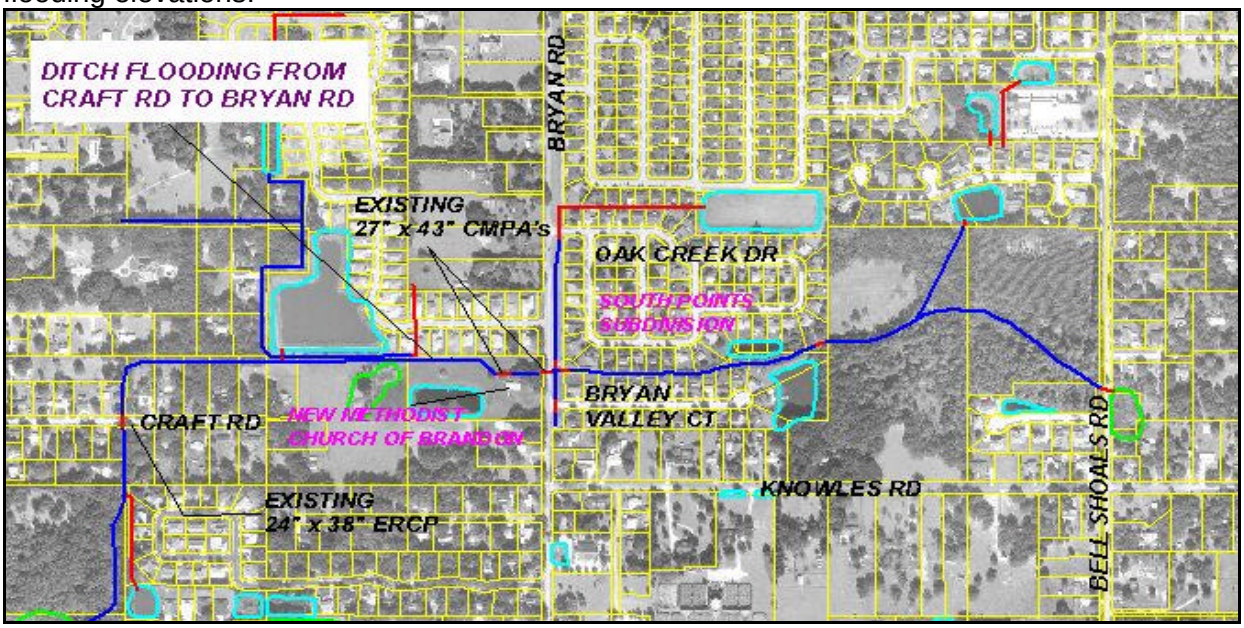
Recommendation: Because of its greater effectiveness in achieving the desired flooding LOS objectives, better reliability, and more desirable water quality and environmental benefits, the recommended alternative for the Barkfield Street and Huntington Street problem areas is Alternative 2.

Problem Area BUCK-3: Craft Road Ditch between Craft Rd. and Bryan Rd.

Problem Definition:

Excessive flooding conditions exist along the Craft Road Ditch system from Craft Road to Bryan Road. Although the County road crossings meet the 10-year road flooding level of service criterion, the New Methodist Church of Brandon on Bryan Road would likely experience structural flooding during this and possibly smaller storm events. This same location was a designated problem in the County's original 1988 master plan study of the

Buckhorn Creek Subwatershed. Several hydraulic improvements were recommended in the 1988 study that may still be pertinent today. The Craft Road and Bryan Road crossings require enlargement to reduce the excessive hydraulic head losses at these two locations. Channel maintenance and/or regrading may also be necessary to achieve the adopted LOS. The issue with these alternatives is that of downstream impacts of increased peak flows and flooding elevations.



Buck-3 Flooding Problem Area Location Map



Church property downstream (west) of Bryan Road on Craft Road Ditch



Existing Church Road 27”x43” CMPA



Existing Craft Road 24”x38” ERCP on Craft Road Ditch

Alternative Solutions:

Alternative 1:

Description: This alternative addresses the identified flooding problem areas with conveyance improvements to the Craft Road Ditch system from Craft Road upstream to Bryan Road. The existing Craft Road 24"x38" ERCP is replaced with a 38"x60" ERCP, and the existing Bryan Road and private church road 27'x43" CMPA's are also replaced with 38"x60" ERCP's. In addition, the ditch downstream of Bryan Road is regraded and enlarged for a distance of 600 feet to achieve a greater hydraulic capacity in this channel segment and accommodate the larger culvert size.

Advantages: The alternative achieves an acceptable flooding LOS by attaining greater hydraulic capacity in the Craft Road Ditch. There is no required purchase of land except perhaps a drainage easement for the proposed channel improvements within the New Methodist Church of Brandon property west of Bryan Road. Environmental permitting for the improvements should not be difficult.

Disadvantages: There are no water quality or environmental benefits provided by this alternative. Drainage easements could be required for the construction and continued maintenance of the new stormwater conveyances, thus the cooperation of affected property owners will be necessary.

Effectiveness: Model results indicate that this alternative will achieve a 25-year LOS B at the Craft Road and Bryan Road crossings of the Craft Road Ditch. The 10-year and 25-year flood elevations are reduced by 1.0 feet and 1.2 feet, respectively, on the west side of Bryan Road. Also, the Craft Road crossing will be able to pass the 10-year peak flow without overtop. Most importantly, model results indicate no adverse downstream impacts in terms of peak flow and flood elevation despite the conveyance system improvements. This counterintuitive result is because the Craft Road culvert is so constrictive that it backs floodwater into floodplain storage early in the storm hydrograph. By opening this constriction with a larger culvert, this natural floodplain storage is conserved until later in the hydrograph and is available to more effectively attenuate peak flows discharged to downstream reaches of the drainage system**.**

Estimated Cost: The capital cost of this alternative is estimated at $41,600. This figure does not include the purchase of any necessary drainage easements to construct the new drainage conveyances.

Alternative 2:

Description: Alternative 2 includes all of the same Alternative 1 culvert replacements plus the construction of a 5.8-acre on-line stormwater detention pond located in what is currently a wet pasture just west of the New Methodist Church of Brandon property. The function of this pond would be to attenuate peak flood flows while providing additional water quality and environmental benefits for the downstream reaches of Craft Road Ditch and Buckhorn Creek. Because there is a small existing pond located within the proposed site, the weir control elevation of the new pond would be set at the current normal pool elevation, estimated at 32.5 ft NGVD, with a crest length of 5 feet. The top of bank of the new pond would be set at elevation 37.0 ft NGVD.

Advantages: The alternative achieves an acceptable flooding LOS by attaining greater hydraulic capacity in the Craft Road Ditch and attenuating peak flows in downstream reaches of the ditch and Buckhorn Creek. There are water quality benefits provided by the treatment of stormwater runoff in the proposed detention pond. In addition, there is an opportunity for creation of up to 5.8 acres of new wetland habitat within the proposed detention pond. Environmental permitting for the improvements should not be difficult, and the County may be able to obtain wetland mitigation credits with the new pond.

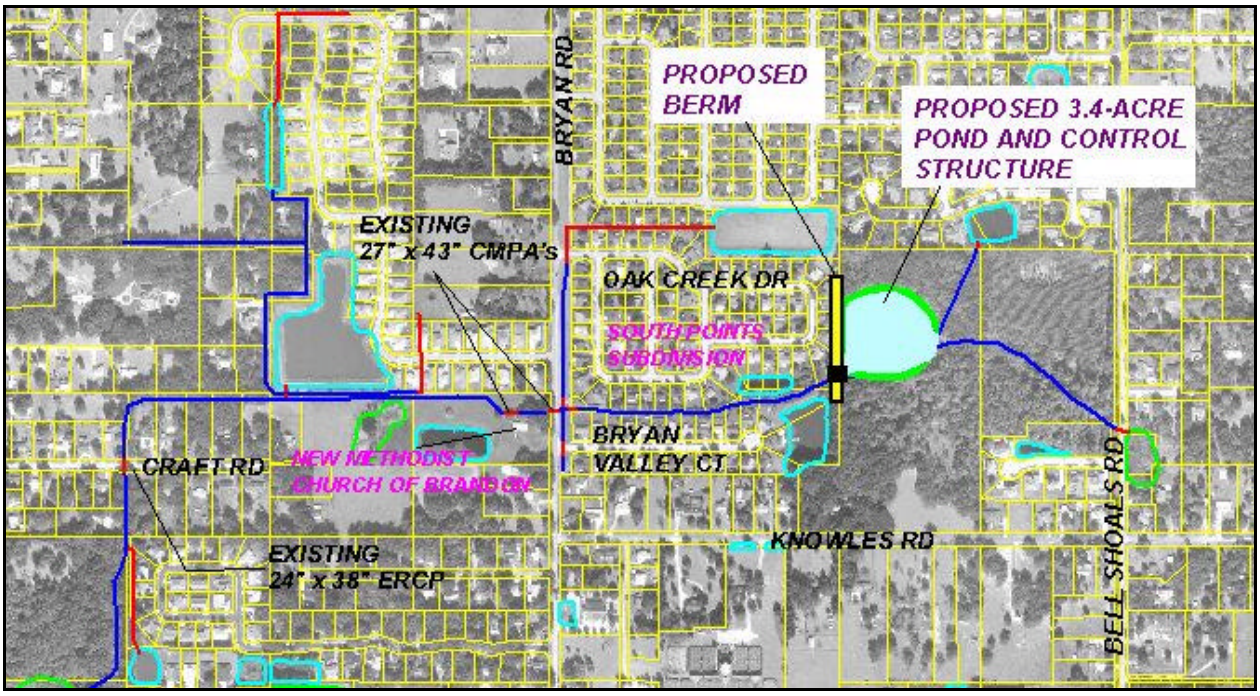
Disadvantages: The alternative requires the purchase of approximately eight acres of undeveloped land, including multiple parcels, for construction and continued maintenance of the proposed detention pond. Thus the cooperation of affected property owners will be necessary.

Effectiveness: While this alternative will achieve a 25-year LOS B at the Craft Road and Bryan Road crossings of the Craft Road Ditch, it adds very little improvement over Alternative 1 in terms of flood benefits. This is likely because the site of the proposed detention pond is already a part of the existing floodplain and there is no appreciable additional storage being provided since there can be no increase of flood elevation on upstream or adjacent properties.

Estimated Cost: The capital cost of this alternative is estimated at $755,000. This figure includes the purchase of the pond site, pond excavation, and construction of the new drainage conveyances.

Alternative 3:

Description: Alternative 3 achieves effective flood attenuation in the Craft Road Ditch with the construction of a 3.4-acre on-line stormwater detention pond located in what is currently a wet pasture just east of the Southpointe Subdivision (west of Bell Shoals Road). The pond would be created by both excavation at the site and construction of a berm across the floodplain with a top of bank elevation of 44.0 ft NGVD. The pond outfall would consist of a combination structure with a 2’ weir notch at elevation 37.5 ft NGVD and 10’ overflow spillway weir at elevation 42.5 ft NGVD. The function of this pond would be to attenuate peak flood flows while providing additional water quality and environmental benefits for the downstream reaches of Craft Road Ditch and Buckhorn Creek. With the reduction of peak flows, the culvert replacements at Bryan Road and the church road can be downsized to 34”x53” ERCP’s, but the Craft Road culvert replacement is still a 38”x60” ERCP with this alternative.



Buck-3 Flooding Problem Area Alternative 3 Detention Pond Site



Existing wet pasture at proposed Craft Road Ditch Alternative 3 Detention Pond site

Advantages: The alternative achieves an acceptable flooding LOS by attaining greater hydraulic capacity in the Craft Road Ditch system and attenuating peak flows in downstream reaches of the ditch and Buckhorn Creek. There are water quality benefits provided by the treatment of stormwater runoff in the proposed detention pond. In addition, there is an opportunity for creation of up to 3.4 acres of new wetland

habitat within the proposed detention pond. Environmental permitting for the improvements should not be difficult, and the County may be able to obtain wetland mitigation credits with the new pond. The site is contained within a single parcel that, if purchased in whole, could be utilized for other purposes such as recreation, education, passive park, and conservation.

Disadvantages: The alternative requires the purchase of approximately sixteen acres of undeveloped land for construction and continued maintenance of the proposed detention pond. Thus the cooperation of the existing property owner will be necessary.

Effectiveness: Model results indicate that this alternative will achieve a 25-year LOS A at both the Craft Road and Bryan Road crossings of the Craft Road Ditch. The 10-year and 25-year flood elevations are reduced by 1.9 feet and 1.7 feet, respectively, on the west side of Bryan Road. Model results show appreciable downstream peak flow reductions. At Bryan Road, the 10-year and 25-year peak flows are decreased from 111 cfs to 55 cfs, and from 185 cfs to 82 cfs, respectively. At Craft Road, the reductions are from 98 cfs to 70 cfs, and from 158 cfs to 99 cfs, respectively. Even in Buckhorn Creek, the 25-year peak flow is reduced from 552 cfs to 514 cfs. These reductions are achieved with no increase in flood elevations upstream of the proposed pond site. At the pond site itself, additional flood storage is being provided by raising the existing flood elevations by 0.5 and 0.8 feet for the 10-year and 25-year storm events, respectively.

Estimated Cost: The capital cost of this alternative is estimated at $1,185,000. This figure includes the costs of purchase of the pond site, pond excavation, and construction of the new drainage conveyances.

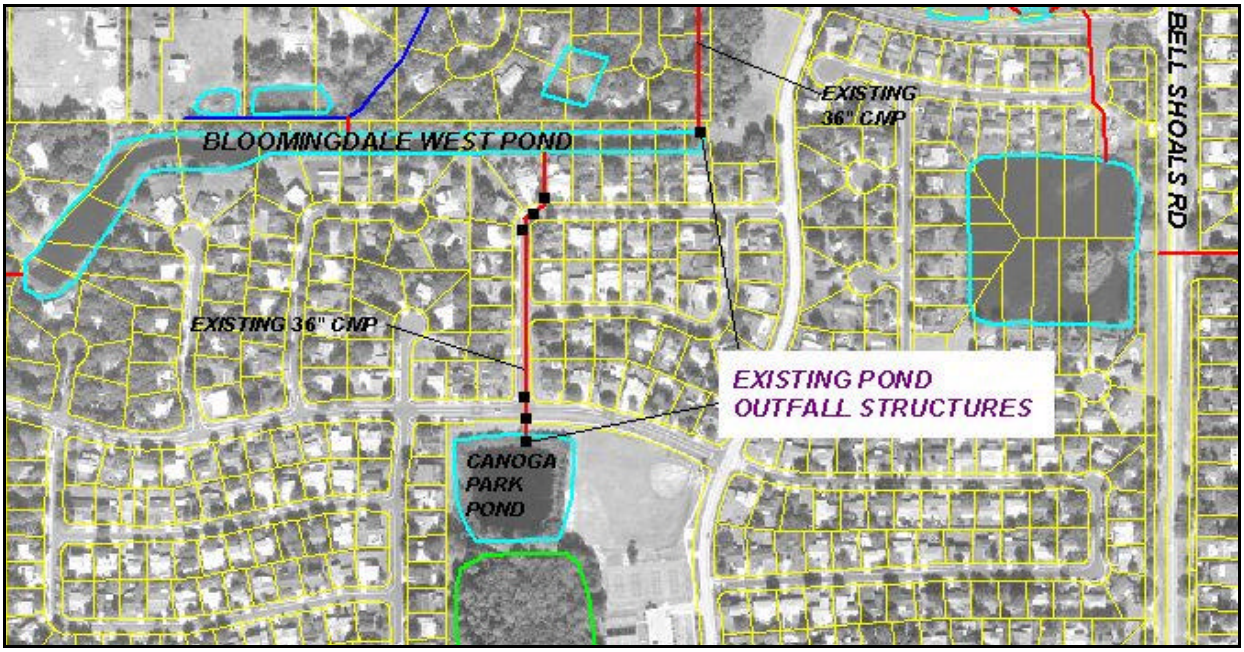
Recommendation: Although the desired flood control objectives can be achieved at a much lower cost with Alternative 1, appreciably greater effectiveness can be attained with Alternative 3 along with highly desirable water quality, environmental, and possibly additional benefits. Because of these multiple benefits that are consistent with the watershed plan objectives, the recommended alternative for the Craft Road Ditch problem areas is Alternative 3.

Problem Area BUCK-4: Bloomingdale West Pond Outfalls

Problem Definition:

The Bloomingdale West Subdivision has two stormwater detention ponds that serve as the primary storage facilities for this residential subdivision. The ponds do not appear to receive any maintenance, as the outfall structures are overgrown and function is impaired such that flooding problems could arise if a significant storm event were to occur. The entire subdivision drainage system was constructed of corrugated metal pipe, which is corroded and likely in need of repair in the near future. Model results do not indicate flooding level of service violations, but there is overtop of the Bloomingdale West pond bank for the 10-year storm event. Additionally, the existing pond outfall structures were constructed prior to Chapter 17-25 regulations, so no formal stormwater treatment provisions are incorporated in their current design.

Alternatives were analyzed that replace the existing outfall structures for the Canoga Park and the Bloomingdale West ponds with modified FDOT inlet structures that will provide enhanced flood control and stormwater treatment function over the existing structures. The County Central Service Unit identified some of these problems that were not addressed due to lack of access and/or easements. Any action to address the identified problems will require easements and/or access for construction and continued maintenance.



Buck-4 Flooding Problem Area Location Map



Existing Canoga Park Pond outfall structure in Bloomingdale West subdivision



Existing Bloomingdale West Subdivision Pond outfall structure

Alternative Solutions:

Alternative 1:

Description: Alternative 1 is to take no action. Ultimately, the structures would fail and either the local residents or the County would take responsibility for repairing any damages and replacement of the structures at that time.

Advantages: There is no initial cost.

Disadvantages: There is no resolution to a problem that will continue until action is taken or structure failure. Failure could potentially add damages to the cost of repair.

Effectiveness: The "no action" alternative is not effective in resolving the defined problem.

Estimated Cost: The initial capital cost of this alternative is zero. However, no action only postpones the cost of retrofit with the potential for additional costs for damage repairs.

Alternative 2:

Description: Alternative 2 is to replace the existing pond outfall structures with new outfalls that mimic the exact same hydraulic performance. This would consist of modified FDOT Type E inlets with weir notches of the same length and crest elevation as the existing. The new pond outfall structures would be equipped with skimmer

plates, per current design practice, to provide enhanced stormwater treatment efficiency.

Advantages: The new structures will provide reliable performance comparable to the existing structures and design with enhanced water quality treatment function. Environmental permitting should not be an issue.

Disadvantages: The Bloomingdale West pond bank will still be overtopped by the 10-year storm event.

Effectiveness: The alternative will be an effective means of restoring and ensuring proper performance of the existing drainage system and reduce exposure to potential damages resulting from structure failure and/or lack of maintenance. Flooding conditions will remain the same; the Bloomingdale West pond bank will be overtopped by the 10-year event.

Estimated Cost: The capital cost of this alternative is estimated at $9,900. This figure includes only the cost of construction of the new pond structures. It is presumed that the local residents will welcome the improvements, so no cost of access in the form of easements is included.

Alternative 3:

Description: Alternative 3 is to replace the existing pond outfall structures with new outfalls that provide enhanced hydraulic performance. This would consist of modified FDOT Type E inlets with weir notches of different length and crest elevation as the existing. For the Canoga Park pond outfall, the control weirs would be modified to have one 3.5’ notch at elevation 49.9 ft NGVD, and one 5.0’ notch at elevation 51.5 ft NGVD. The Bloomingdale West pond outfall would lower the pond normal pool elevation by 0.5 feet (the pond currently provides only 2.0 feet of storage below the top of bank). This new structure would have a 13.0’ weir crest at elevation 42.5 ft NGVD. The new pond outfall structures would be equipped with skimmer plates, per current design practice, to provide enhanced stormwater treatment efficiency.

Advantages: The new structure will provide reliable performance comparable to the existing structures and design with enhanced water quality treatment function. The Bloomingdale West pond bank will not be overtopped by the 10-year storm event.

Disadvantages: Environmental permitting may be an issue with regards to lowering of the pond normal pool elevation, but considering that there are no existing permits to modify, other benefits may override concerns.

Effectiveness: The alternative will be an effective means of restoring and ensuring proper performance of the existing drainage system and reduce exposure to potential damages resulting from structure failure and/or lack of maintenance. Flooding conditions will be slightly improved, as the Bloomingdale West pond bank will not be overtopped by the 10-year event.

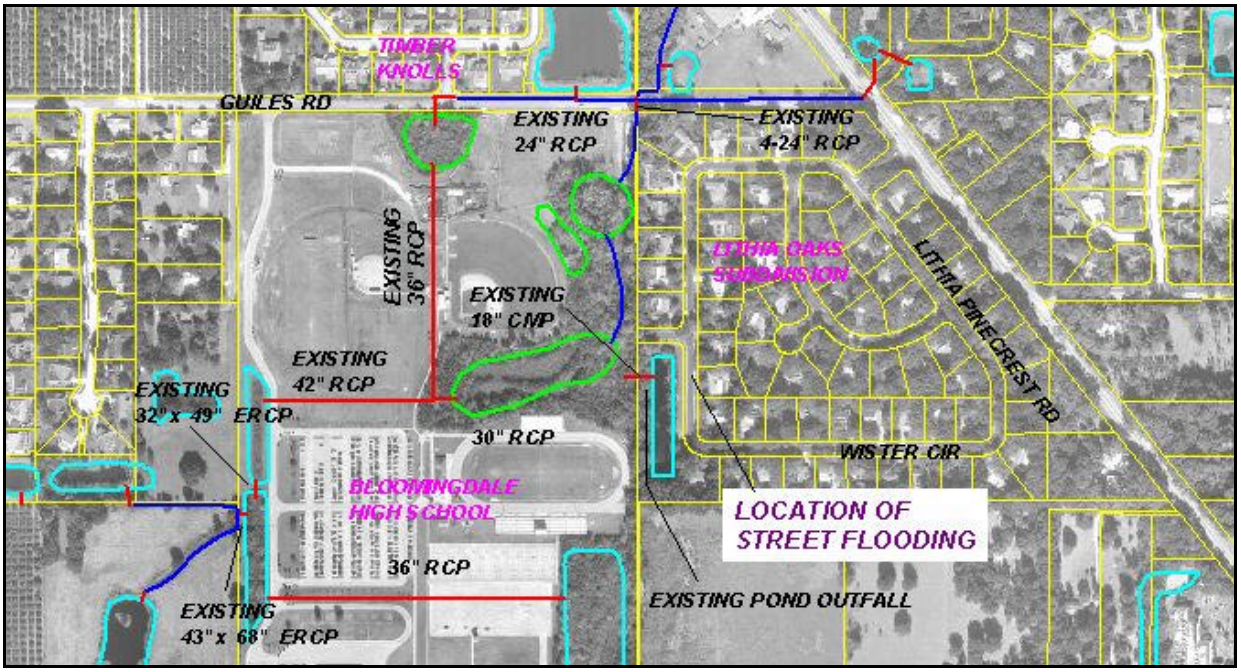
Estimated Cost: The capital cost of this alternative is estimated at $9,900. This figure includes the cost of construction of the new pond structures, only. It is presumed that the local residents will welcome the improvements, so no cost of access in the form of easements is included.

Recommendation: Maintenance and structure retrofit is considered best performed on a proactive basis rather than reactive (i.e. after failure). Because of the added flood control and water quality benefits, the recommended alternative for the Bloomingdale West pond outfall problem area is Alternative 3.

Problem Area BUCK-5: Lithia Oaks Pond Outfall

Problem Definition:

The Lithia Oaks Subdivision (formerly known as Buckhorn Springs Manor) detention pond that serves as the primary storage facility for this residential subdivision does not have a functional outfall structure. The pond does not appear to receive any maintenance and the outfall consists of an 18" CMP pipe that is collapsed and silted. Function is impaired such that flooding problems could arise if a significant storm event was to occur, and it is possible that the pond bank has already been breached. Lithia Oaks flooding problems were identified in the original 1988 Buckhorn Creek study. The current model results confirm flooding level of service violations despite the recent diversion of drainage from Guiles Road that previously discharged to the subdivision. There is flooding of 0.9 feet shown on Wister Circle during the 10-year storm event. The pond is contained entirely within a parcel owned by a local resident. Hence, any action to address the identified problems will require an easement and/or access for construction and continued maintenance.



Buck-5 Flooding Problem Area Location Map



Existing Bloomingdale West Subdivision Pond outfall structure

Alternative Solutions:

Alternative 1:

Description: Alternative 1 is to take no action.

Advantages: There is no initial cost.

Disadvantages: There is no resolution to the defined problem. Pond bank failure could potentially create downstream damages and add to the cost of repair.

Effectiveness: The "no action" alternative is not effective in resolving the defined problem.

Estimated Cost: The initial capital cost of this alternative is zero. However, no action only postpones the cost of retrofit with the potential for additional costs for damage repairs.

Alternative 2:

Description: Alternative 2 is to address the defined problems with the replacement of the existing outfall structure for the Lithia Oaks pond by a 24" RCP with a modified FDOT Type C inlet structure that will provide enhanced flood control and stormwater treatment functions over the existing structure. The inlet structure would have a 3.0' slot at elevation 61.0 ft NGVD (same normal pool elevation as existing) and an 8.0' primary overflow weir at elevation 62.5 ft NGVD. The new pond outfall structure would be equipped with a skimmer plate, per current design practice, to provide enhanced stormwater treatment efficiency.

Advantages: This alternative will resolve the problem of a dysfunctional outfall structure and achieve the flooding level of service goal for this area. The new design will also provide enhanced water quality treatment for the subdivision stormwater drainage above that provided by the current structure. Environmental permitting should not be an issue. New structure performs better hydraulically and lowers the downstream peak flood elevation on the Bloomingdale High School grounds.

Disadvantages: Requires cooperation of local resident/property owner.

Effectiveness: The alternative achieves a 10-year flooding LOS A condition on Wister Circle and contains the 25-year flood within pond bank. The outfall retrofit will be an effective means of restoring and ensuring proper performance of the existing drainage system and reduce exposure to potential damages resulting from structure failure and/or lack of maintenance. Downstream flooding conditions at Bloomingdale High School will be slightly improved for the 25-year storm event.

Estimated Cost: The capital cost of this alternative is estimated at $7,300. This figure includes the cost of construction of the new pond structure only. It is presumed that the local resident/owner would welcome the improvements, so no cost of access in the form of easements is included.

Recommendation: To achieve the flooding LOS goal and provide enhanced water quality benefits, the recommended alternative for the Lithia Oaks pond outfall problem area is Alternative 2.

Problem Area BUCK-6: Buckhorn Creek between Kings Ave. and Holland Dr.

Problem Definition:

Buckhorn Creek traverses a set of large tracts of privately owned land between Holland Road and the Bloomingdale Plaza shopping center south of Bloomingdale Avenue. Mostly unoccupied, this is the last remaining unencroached part of the natural floodplain of the creek upstream of the Bloomingdale Avenue bridge and portions of the tracts are impacted wetlands. The creek is in an unmaintained state, and excessive channel vegetation creates a hydraulic impediment. Current modeling analysis indicates a LOS deficiency at a private dirt road that floods nearly a foot deep during the 10-year storm event. The flood profile plots show that the structure, consisting of two 59”x81” CMPA’s, is inundated by tailwater conditions (i.e. from the downstream reach of the creek) and no flooding problems are created upstream by this constriction. This problem area was identified in the original 1988 master plan study, and a replacement structure was recommended. Local residents indicate that structural flooding has occurred in the past.

Downstream from this area, the creek passes through residential developments with low street grades that do not meet a 25-year LOS B condition. Flooding of Van Gogh Circle, located between the Kings Avenue and John Moore Road bridges, is 0.8 feet deep for the 25-year event. The original 1988 master plan study also identified problems within this area of the main stem. There are currently no road crossing restrictions within this portion of the Buckhorn Creek drainage system since a number of road improvement projects in the past twelve years have resulted in replacements of Buckhorn Creek culverts with larger structures

(e.g. Kings Avenue, John Moore Road, and Bloomingdale Avenue). Flooding conditions along the main channel have thereby improved since the original 1988 master plan. These past improvements have done nothing, however, to reduce peak flows, and the County Central Service Unit has identified channel bank erosion problems in this area. As new development in the subwatershed continues unabated, it is likely that increased flows and velocities will exacerbate such localized erosion problems.



Buck-6 Flooding Problem Area Location Map



Excessive vegetation growth in existing Buckhorn Creek main channel between Bloomingdale Plaza and Holland Road south of Bloomingdale Avenue

Alternative Solutions:

Alternative 1:

Description: Alternative 1 is to take no action.

Advantages: There is no cost.

Disadvantages: There is no resolution to the defined problems.

Effectiveness: The "no action" alternative is not effective in resolving the defined problems. The defined flooding LOS violation is a private road for which the County does not assume responsibility. Downstream flooding at Van Gogh Circle is not a problem for the 10-year event, and the County can continue to use this as the target LOS for the Buckhorn Creek Subwatershed.

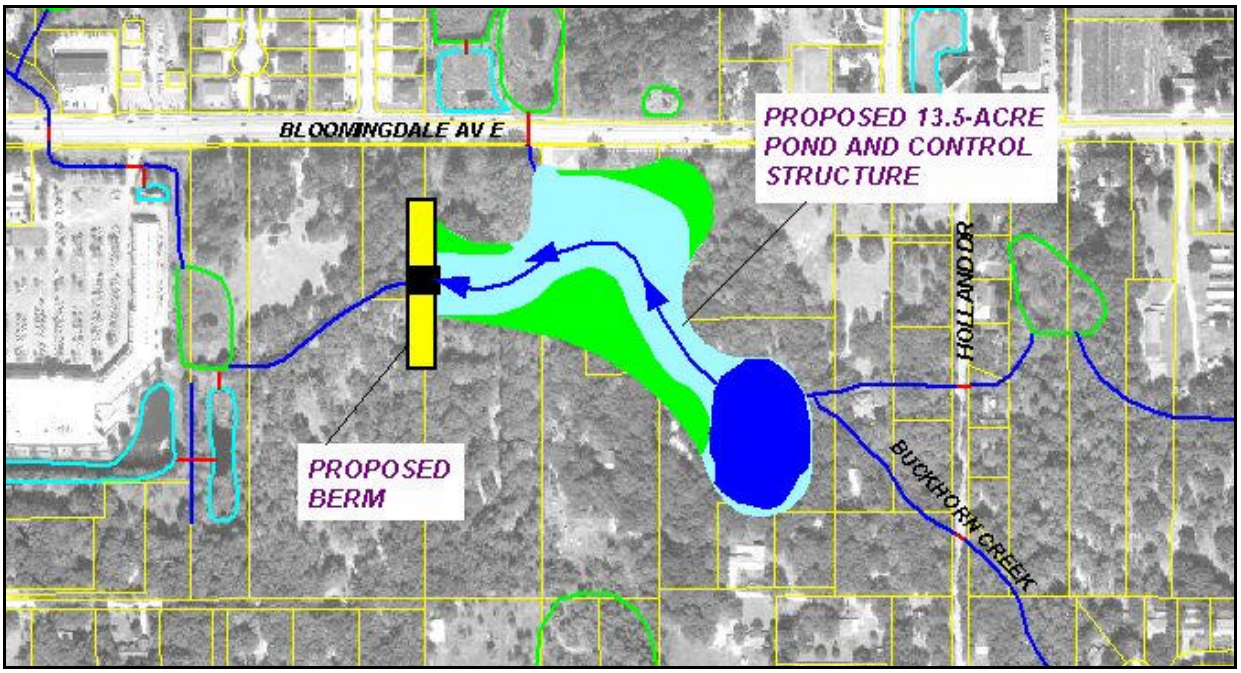
Estimated Cost: The initial capital cost of this alternative is zero.

Alternative 2:

Description: This alternative consists of the purchase of the properties that encompass the floodplain between Bloomingdale Plaza and Holland Drive and conversion of the area to a compatible use that restores and preserves the natural floodplain. This area provides an opportunity to preserve the natural floodplain and restore wetland functions while providing both flood control and stormwater treatment benefits.

All or portions of five land parcels along this portion of the main Buckhorn Creek channel would be purchased to construct a 13.5-acre on-line stormwater detention pond, encompassing an existing isolated 1.7-acre pond within its confines. The pond would be created by both excavation at the site and construction of a berm across the floodplain with a top of bank elevation of 33.0 ft NGVD. The embankment would be located at the western property line of the parcel approximately 300 west (downstream) of the existing private road that crosses the creek. Thus the existing road crossing and much of the overgrown channel will be eliminated by incorporation into the pond. The pond outfall would consist of an 8'-long overflow spillway weir with a crest elevation of 27.0 ft NGVD. This normal pool elevation was approximated from topographic mapping with the intent of maintaining current water table and adjacent wetland hydroperiod conditions.

The function of this proposed pond would be to attenuate peak flood flows in the downstream reaches of Buckhorn Creek while providing additional water quality and environmental enhancement benefits. As designed, the new detention pond facility will reduce the downstream peak flows by approximately 15-24% and lower the 25-year flood elevation by 0.6 feet at Van Gogh Circle.



Buck-6 Flooding Problem Area Alternative 2 Detention Pond Site

Advantages: The alternative will eliminate all defined flooding LOS deficiencies along the main channel of Buckhorn Creek and attain a full 25-year LOS B by reducing peak flows downstream of the proposed pond. The natural floodplain of Buckhorn Creek will be preserved instead of succumbing to development pressures. There will be up to 13.5 acres of new created wetlands that will provide valuable environmental habitat and enhanced stormwater treatment function in the watershed. The County may be able to obtain wetland mitigation credits with the new pond. The proposed pond site uses only a portion of the five land parcels. If purchased in whole, the remaining upland areas could be utilized for other purposes such as recreation, education, passive park, and conservation.

Disadvantages: The alternative requires the purchase of five land parcels to construct the proposed detention pond. Some of these properties may be currently on the market, but implementation would require willing sellers. There are some residential structures located on the properties. Environmental permitting for the proposed pond could be difficult, since it consists of impounding an existing jurisdictional waterway.

Effectiveness: Model results indicate that this alternative will result in the achievement of a 25-year LOS A for the complete length of the Buckhorn Creek main channel from the Alafia River to Bell Shoals Road. The 25-year flood elevation is reduced by 0.6 feet at the low road point of Van Gogh Circle. Model results also show appreciable downstream peak flow reductions. Immediately downstream of the proposed pond, the 25-year peak flow is decreased from 418 cfs to 308 cfs. At Kings Avenue, the reduction is from 596 cfs to 505 cfs. These reductions are achieved with no increase in flood elevations upstream of the proposed pond site, nor on adjacent properties.

Estimated Cost: The capital cost of this alternative is estimated at $1,760,000. This figure includes the costs of purchase of the 5 individual land parcels for the pond site, pond excavation, and construction of the appurtenant structures.

Recommendation: Although the County's adopted flooding level of service for Buckhorn Creek is a 10-year LOS B, greater flood control objectives can be attained in this subwatershed with the implementation of the proposed Alternative 2, along with highly desirable water quality, environmental, floodplain preservation, and possibly additional benefits. Because of these multiple benefits that are consistent with the watershed plan objectives, the recommended alternative for this problem area is Alternative 2.

13.2.2 Bell Creek Subwatershed

The County's adopted *Target Level of Service* for the Bell Creek Subwatershed is a minimum goal of Level 'B' for the 25-year, 24-hour design storm event. There are six (6) locations identified within the Bell Creek Subwatershed where the County's minimum acceptable level of service criteria are not met (See Table 6.5-4 and Figure 6.5-3). Of these six locations, none are Hillsborough County improved public roadways or provide flooding to existing structures. Therefore, no alternatives were analyzed to provide flood protection for the LOS deficiencies that were identified.

In addition to the LOS deficiency areas that were identified through the modeling of the existing hydrologic and hydraulic conditions, other flooding problem areas were identified based on input received during public meetings or from Hillsborough County Service Unit or historical flooding complaints databases (See Figure 6.5-1). These problem areas were investigated where there was sufficient information provided and alternative measures analyzed. In some cases, further detailed study is needed. In many instances, the problem was related to a maintenance issue and it was added to a list of recommended maintenance needs provided in Chapter 15.

The following discussion details the flooding problems identified in the Bell Creek Subwatershed, and provides a description of the proposed solutions and alternatives. The locations of these projects are shown in Figure 13.1-1.

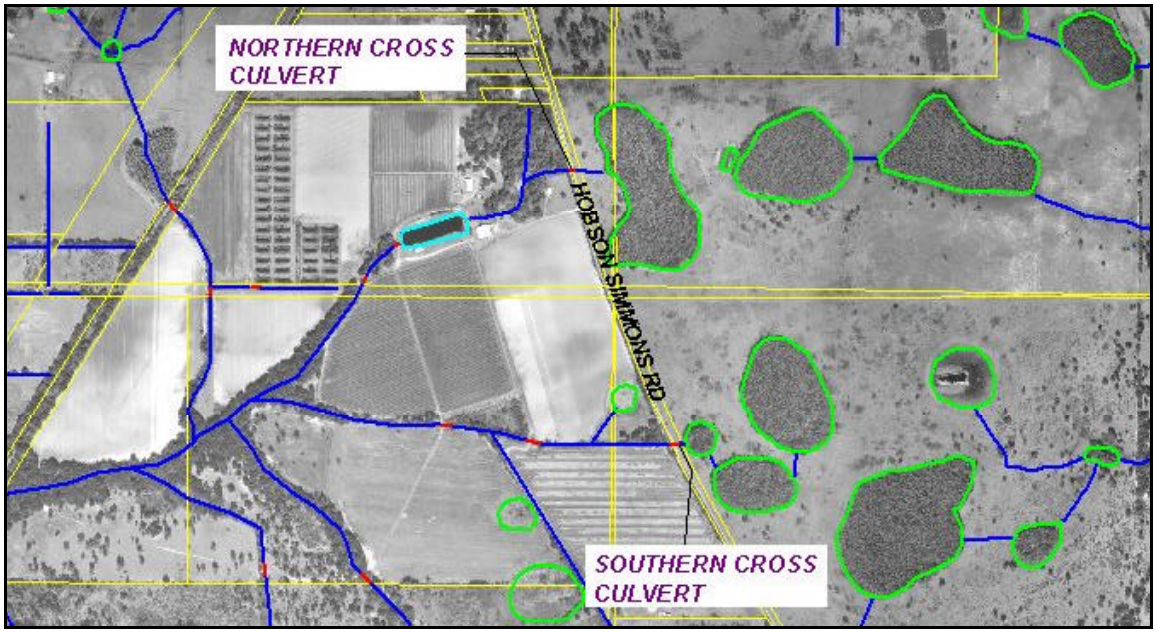
Problem Area BELL-1: Hobson Simmons Road

Problem Definition:

According to the staff at Hillsborough County South Service Unit, flooding occurs along Hobson Simmons Road. There are culvert crossings at two locations along this road that convey the stormwater discharge from the wetlands located on the east side of the road westerly through an existing drainage ditch. These two culverts are identified as the northern culvert and the southern culvert in the figure presented below. This tertiary drainage system is not included in the watershed hydraulic/hydrologic model. Therefore, evaluations are based solely upon field observations.

Field investigations revealed that the roadside ditch system along Hobson Simmons Road is overgrown with heavy vegetation. Additionally, the southern culvert has a restricted

conveyance capacity due to the accumulation of silt and debris. The culvert appears to be a 29" x 45" ERCP; however, only a 10" x 45" opening is available on the upstream end of the pipe. This limits its conveyance capacity underneath Hobson Simmons Road. The northern culvert also has a small amount of accumulated silt, thus restricting its ability to convey stormwater runoff.



Bell-1 Problem Area Location Map



Hobson Simmons Road – Southern Cross Culvert (u/s) and Roadside Ditch



Hobson Simmons Road – Northern Cross Culvert (u/s)

Alternative Solutions:

Description: The recommended solution is to provide maintenance on a regular basis. The roadside ditches along Hobson Simmons Road should be cleared of excessive vegetation and both the northern and southern culverts should be cleared of the accumulated silt and debris. Emphasis should be placed on the actual removal of mass rather than mowing and/or use of herbicides that leave the conveyances impaired. The ditches at the downstream end of the culverts should also be regraded to provide a positive outfall.

Advantages: Regular maintaining of this roadside ditch system should provide the anticipated flood relief along Hobson Simmons Road. Otherwise, further modeling should be accomplished to determine the required improvements to the conveyance system. This recommendation does not require additional land acquisition since the County owns the right-of-way along Hobson Simmons Road.

Disadvantages: There are no disadvantages associated with this alternative.

Effectiveness: This recommended alternative will provide flood relief along Hobson Simmons Road, but since this tertiary conveyance system was not included in the hydrologic and hydraulic model an accurate assessment of its performance cannot be evaluated at the present time.

Estimated Cost: The estimated capital costs for this project would be $25,700.

Recommendation: This solution is the recommended alternative. No other options were analyzed since this problem can be resolved by maintenance.

13.2.3 Fishhawk Creek Subwatershed

The County's adopted *Target Level of Service* for the Fishhawk Creek Subwatershed is a minimum goal of Level 'B' for the 25-year, 24-hour design storm event. Seven locations were identified that did not meet the County's minimum *Target Level of Service* criteria based on flood stages predicted by the model (See Table 6.6-4 and Figure 6.6-3). The definitions given for the Hillsborough County flood level-of-service (LOS) are for County-owned public works infrastructure. This does not include private or unpaved roads, which disqualifies the seven LOS deficient locations for alternative analysis. All seven of these locations were either dirt roads or private access roads

In addition to the LOS deficiency areas that were identified through the modeling of the existing hydrologic and hydraulic conditions, other flooding problem areas were identified based on input received during public meetings or from Hillsborough County Service Unit or historical flooding complaints databases (See Figure 6.6-1). There have been three "flood complaints" made within the Fishhawk Creek Subwatershed as listed in Table 6.6-1, however no information was provided to describe the nature of the problems. Since the flood complaint database did not record the nature of the flooding problem, these complaints were not addressed. There was also one Hillsborough County South Service Unit concern relating a road flooding problem at the intersection of Boyette Road and Dorman Road. The current model analysis did not include this intersection, as it was not a part of the primary or secondary drainage systems. However, field investigations have determined that there is a 24" RCP that conveys flow from north to south under Dorman Road but is half-buried (8"-9") with sediment build-up. Flooding at this intersection is localized. Proper maintenance of the RCP pipe and clearing of the channel both up and downstream to realize the full capacity of the pipe may alleviate this localized flooding problem. (If flooding conditions continue, then a more detailed study will be required to determine necessary hydraulic/structural improvements). Maintenance issues are discussed in further detail in Chapter 15.

In summary, there were no flooding problems within the Fishhawk Creek Subwatershed that warranted an alternatives analysis other than an identified need for maintenance.

13.2.4 Turkey Creek Subwatershed

The County's adopted *Target Level of Service* for the Turkey Creek Subwatershed is a minimum goal of Level 'B' for the 25-year, 24-hour design storm event. There are twenty-six (26) locations identified within the Turkey Creek Subwatershed where the County's minimum acceptable level of service criteria are not met (See Table 6.7-4 and Figure 6.7-3). Of these 26 locations, 14 constitute a LOS deficiency for a Hillsborough County improved public roadway. Eight of the fourteen locations, however, lie within closed basins and were disregarded for reasons described earlier in this chapter.

In addition to the LOS deficiency areas that were identified through the modeling of the existing hydrologic and hydraulic conditions, other flooding problem areas were identified based on input received during public meetings or from Hillsborough County Service Unit or historical flooding complaints databases (See Figure 6.7-1). These problem areas were investigated where there was sufficient information provided and alternative measures analyzed. In some cases, further detailed study is needed. In many instances, the problem

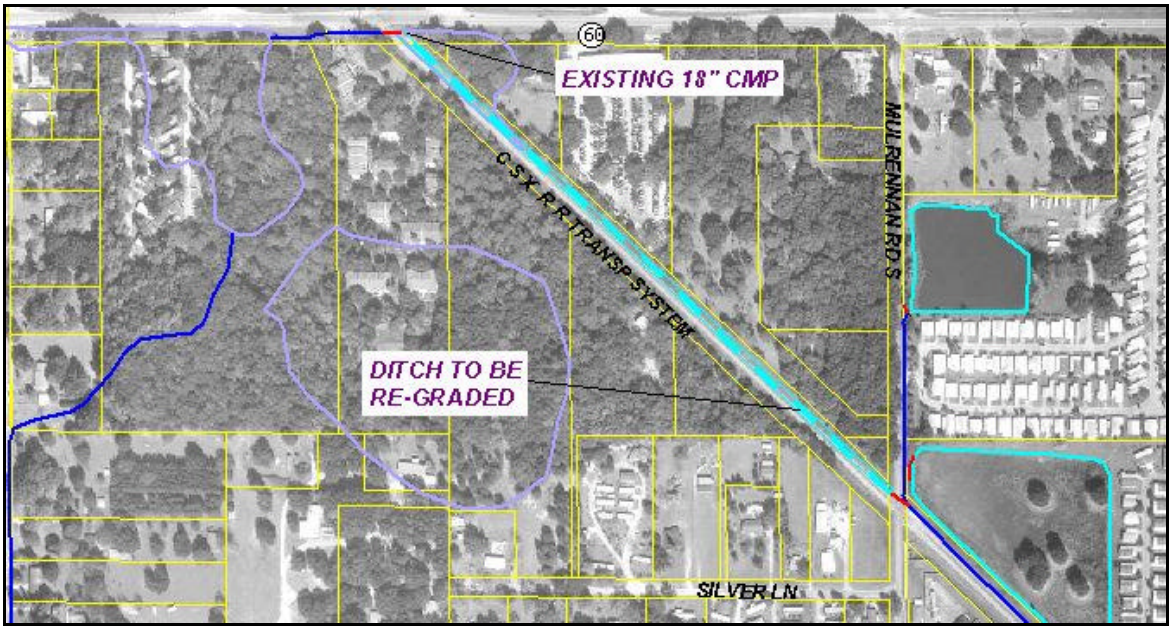
was related to a maintenance issue and it was added to a list of recommended maintenance needs provided in Chapter 15.

The following discussion details the flooding problems identified in the Turkey Creek Subwatershed, and provides a description of the proposed solutions and alternatives. The locations of these projects are shown in Figure 13.1-1.

Problem Area TC-1: CSX Railroad and Mulrennan Road Drainage Improvements

Problem Definition:

Hillsborough County East Service Unit staff stated that standing water ponds in the railroad ditch northwest of Mulrennan Road due to a high point in the ditch. According to County staff, this ponded water percolates through the railroad gravel bed and then flows overland to Silver Lane, where yard and house flooding occurs.



TC-1 Flooding Problem Area Location Map (location of TC-1/CIP # 47191)



CSX RR ditch west of Mulrennan Road



CSX RR 18" CMP at SR 60 (u/s)

Alternative Solutions:

Description: Hillsborough County currently has a project in the construction phase at this location (CIP #47191) to eliminate ponding of stormwater within this railroad ditch. The project consists of re-grading the railroad ditch to a uniform slope, thus eliminating a high point in the ditch gradeline and providing a positive drainage outfall to SR 60. Additionally, the County is installing fabric-formed concrete ditch pavement from Mulrennan Road for approximately 300 feet along the ditch. This concrete pavement will provide further protection from water seeping through the railroad gravel bed.

Furthermore, the railroad culvert at SR 60 (shown above) is in need of maintenance to clear accumulated sediment/debris such that a positive drainage outfall is attained.

Advantages: Grading of the railroad ditch to a uniform slope, thus eliminating the "hump", will eliminate water from ponding on the west side of Mulrennan Road. In addition to re-grading the railroad ditch, clearing the railroad culvert at SR 60 will provide a positive drainage outfall to SR 60.

Disadvantages: There are no disadvantages associated with this alternative.

Effectiveness: This alternative will provide positive drainage relief along this portion of the closed basin.

Estimated Cost: The estimated costs for this alternative is $20,900.

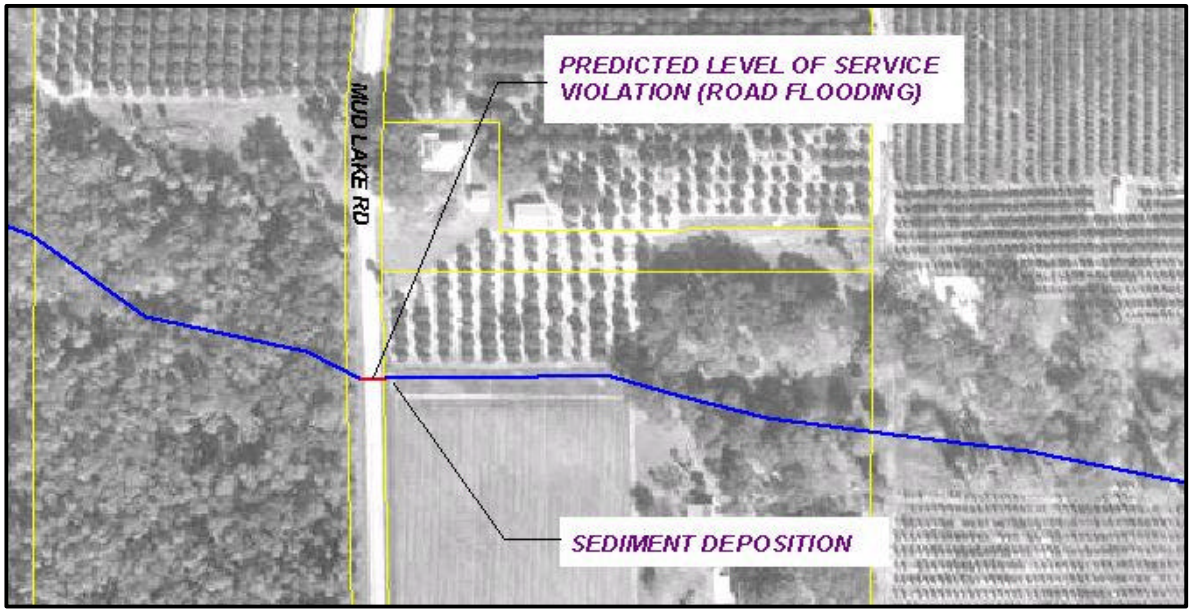
Recommendation: This is the recommended alternative. This project is County CIP # 47191 and is currently in the construction phase.

Problem Area TC-2: Mud Lake Road

Problem Definition:

A level of service deficiency has been identified on Mud Lake Road, just south of the intersection with Bugg Road. The hydrologic/hydraulic model analysis predicts road flooding with a depth of 0.53 feet for the 25-year storm. The primary land use of the 217-acre contributing drainage basin is agricultural, consisting of orange groves and strawberry fields. Downstream of Mud Lake Road is a heavily wooded wetland. This tributary feeds the Little Alafia River which eventually outfalls to the Medard Reservoir. The tributary crosses Mud Lake Road through two 27" by 43" CMPA culverts. The road overtops at 77.88 feet NGVD. For the 25-year design storm, the water surface elevation is predicted to be 78.41 feet NGVD, for a flood depth of 0.53 feet. Sedimentation of the channel is a severe problem, as can be seen in the pictures on the following page. The combination of constrictive pipes and sediment accumulation aggravates flooding conditions.

The strawberry farmers employ plastic mulch that has many beneficial aspects in terms of reducing irrigation needs, pesticide and fertilizer application, and weed control. However, the plastic mulch has drawbacks with respect to stormwater runoff. The mulch acts as an impervious surface increasing stormwater runoff. In addition, this type of agricultural practice can also increase erosion of the soil during heavy rain events, aggravating sedimentation of downstream reaches. As mentioned, downstream of Mud Lake Road, the channel joins with the Little Alafia River to outfall to the Medard Reservoir. In this area, the river corridor is relatively undeveloped, providing a riparian corridor on both sides of the channel. This has tremendous beneficial aspects in terms of floodplain management by connecting the creek channel with the natural floodplain and by allowing the natural migration and meander of the creek to occur unimpeded. It is also beneficial for natural habitat and water quality; therefore, it is very important to prevent the high levels of sedimentation that have been observed in this area.



TC-2 Flooding Problem Area Location Map



The culvert at Mud Lake Road with evidence of high sediment loads.

Alternative Solutions:

Alternative 1:

Description: The flooding predicted at Mud Lake Road can be reduced by replacing the twin 27" by 43" corrugated metal pipes with two precast 3' x 7' box culvert sections. Additionally, the sediment deposit artificially raising the channel bottom must be removed. The problem of siltation and sedimentation at Mud Lake Road is due primarily to current agricultural practices upstream of the crossing. This is easily and clearly seen in pictures above. Assuming the existing culvert was originally installed at the tributary's invert, 1.4 feet of sediment has accumulated at the exit of the culvert. Removal of this sediment and re-grading of the conveyance in this area would enlarge and deepen the channel to some earlier level and eliminate the Level of Service deficiency at this location. While this maintenance type of approach will provide a quick fix to the problem, a longer-term solution is necessary. Sediment control through improved agricultural practices is required. Strawberry farming is a significant land use in this region of Hillsborough County, and has significant impacts on stormwater management issues. The water quality project TC-4/WQ discusses ideas related to this issue.

Advantages: If this alternative is used in conjunction with TC-4WQ, flooding of the road for high flow events will be eliminated and large sediment loads will be reduced. This, in turn, helps reduce the frequency of maintenance.

Disadvantages: There are no disadvantages to this proposed solution.

Effectiveness: A 25-year LOS A condition can be met with implementation of this alternative. Water quality and natural habitat can be improved throughout the downstream river corridor.

Estimated Cost: The estimated cost for this alternative is $54,960

Alternative 2:

Description: Roadway flooding can be reduced by removing the existing culverts and replacing them with two 3' by 7' rectangular box culverts. This reduces the water surface elevation from 78.41 to 78.19 feet for a flood depth of 0.31 feet. This will meet the Hillsborough County requirement for a 25-year LOS B rating.

Advantages: Enlarging the culvert size achieves the minimum Level of Service criteria required by the County's standard.

Disadvantages: The road will still flood during heavy rain events. The culvert and downstream channel will continue to experience high levels of siltation and sediment deposition, requiring a high level of maintenance.

Effectiveness: A 25-year LOS B condition can be met with implementation of this alternative.

Estimated Cost*:* The estimated cost for this alternative is $52,960

Recommendation: Alternative 1 is recommended as the solution to this problem, as it provides a 25-year LOS A for nearly the same cost while providing much needed water quality benefits.

Problem Area TC-3: Bugg Road

Problem Definition:

Unacceptable levels of localized flooding over a portion of Bugg Road are predicted by the existing conditions hydrologic and hydraulic model. The contributing drainage basin is 480 acres. The land use is rural with some low-density residential areas. According to the model, the existing culverts, two 31" x 50" corrugated metal pipes, are undersized when modeled as completely open. The upstream and downstream channels are clear with a minimum of debris; however, the existing culverts under Bugg Road are blocked by sediment by about 50 percent as can be seen in the picture on the following page. This will exacerbate flooding conditions.

Bugg Road overtops at elevation 86.8 feet NGVD and the water surface elevation predicted by the model is 87.43 feet NGVD for a 25-year design storm event. A fence is placed across the channel, providing a potential hazard during large storm events and acting to obstruct the channel in the event of debris collection.



TC-3 Flooding Problem Area Location Map



Bugg Road Existing 2 – 31"x50" CMPA's (d/s)

Alternative Solutions:

Alternative 1:

Description: The head loss across the culverts is 2.1 feet. Therefore, the conveyance capacity of the culvert needs to be increased. Analysis indicates that two 4' by 7' pre-cast box culverts would provide sufficient capacity to eliminate road flooding at this location. The entrance and exit to the culvert should be graded such that a positive hydraulic gradient exists during all flow events. Additionally the fence in the channel should be relocated to prohibit the collection of debris causing obstruction of the flow.

Advantages: Enlarging the conveyance capacity across Bugg Road will eliminate the level of service deficiency and provide suitable conveyance of stormwater runoff to prevent road overtopping for the 25-year design storm.

Disadvantages: There will be temporary environmental and water quality impacts due to the required removal of sediment in the downstream channel regrading activities. This will allow for the culvert enlargement with no downstream flooding impacts.

Effectiveness: This alternative will achieve a 25-year LOS A condition for Bugg Road at this location.

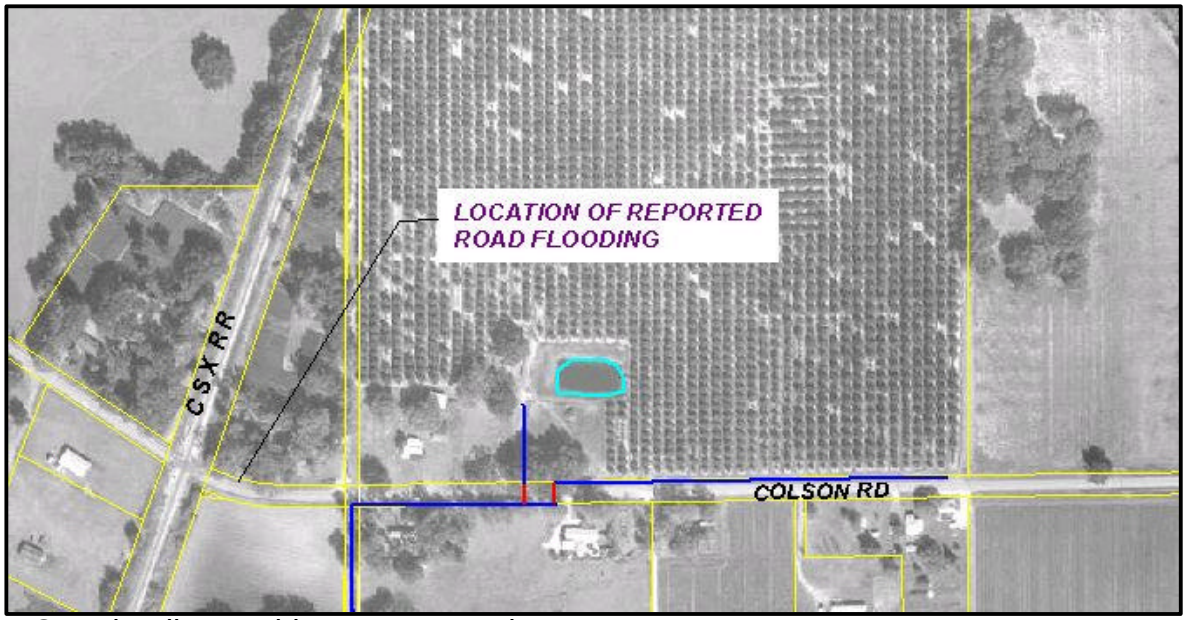
Estimated Cost*:* This alternative will cost approximately $60,700

Recommendation: This is the recommended alternative. No other alternatives were considered.

Problem Area TC-4: Colson Road

Problem Definition:

Local residents and the Hillsborough County East Service Unit reported that Colson Road exhibited flooding conditions during the El Nino storms. The flooding occurred at the curve where Colson Road intersects the Seaboard Coast Line Railroad (on the northeast side). The flooding was such that the road was impassable. There are no cross drains at the intersection of the railroad and Colson Road. The nearest culvert under Colson Road is a 15" HDPE pipe approximately 700 feet to the east of the railroad. This is a localized drainage problem in the secondary system and, as such, it was not included in the hydrologic and hydraulic existing conditions model. The nearest point, junction number 757470, is southeast and downstream at the railroad where the model predicts a 25-year LOS A.



TC-4 Flooding Problem Area Location Map



Colson Road at the intersection with the CSX RR.

Alternative Solutions:

Alternative 1:

Description: Installing a cross drain under Colson Road will alleviate localized flooding at this location by conveying runoff from the north to the south side of the road. A 24" RCP cross drain at the edge of the railroad property line, but within the County right-of-way, is recommended. A swale should be constructed along the north side of Colson Road to facilitate drainage to the cross drain location.

Advantages: This is a simple solution where all work can be accomplished within the right of way, requiring no need for easement acquisition and minimal permitting.

Disadvantages: There are no disadvantages.

Effectiveness: Since this location was not modeled directly, it is not possible to ascertain a quantitative level of effectiveness. An independent drainage analysis should be performed to confirm that the project design achieves a minimum 25-year LOS B.

Estimated Cost*:* This alternative will cost approximately $8,050.

Alternative 2:

Description: With this alternative, stormwater runoff would be diverted along the north side of Colson Road by constructing a ditch/swale system from the railroad along the north side of Colson Road toward the east for approximately 280 feet. A new 24" RCP culvert under Colson Road from north to south would then connect with the existing drainage system, which flows to the south.

Advantages: This alternative would connect the stormwater runoff to an existing conveyance system.

Disadvantages: This alternative requires additional excavation.

Effectiveness: Since this location was not modeled directly, it is not possible to ascertain a quantitative level of effectiveness. An independent drainage analysis should be performed to confirm that the project design achieves a minimum 25-year LOS B.

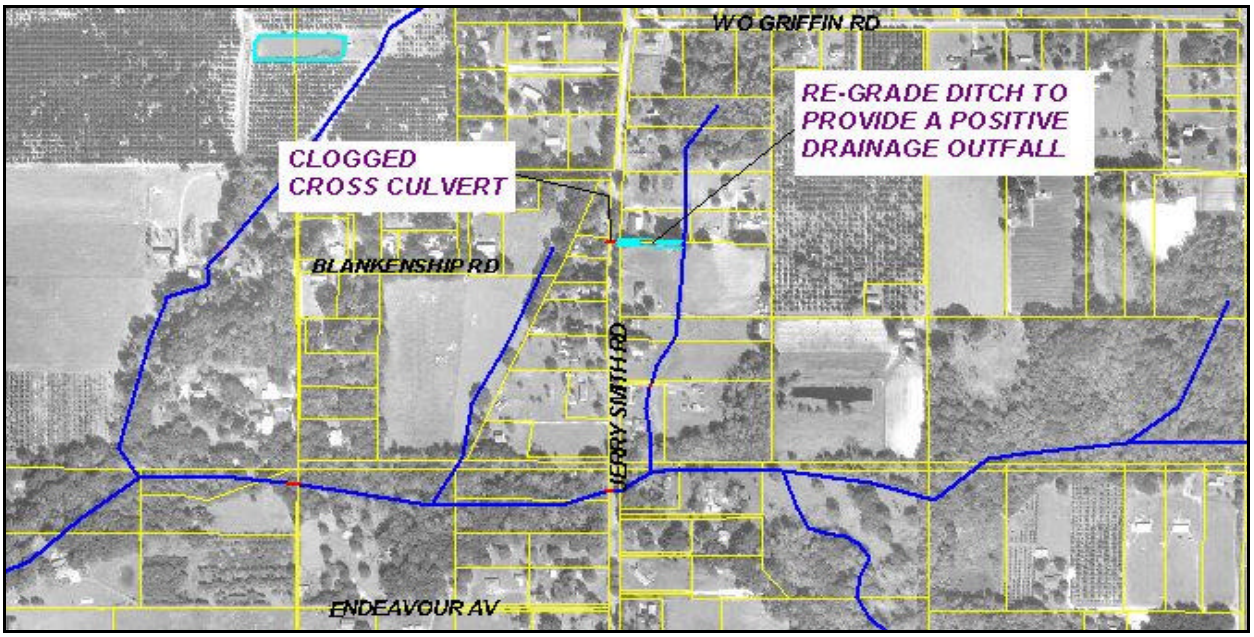
Estimated Cost*:* This alternative will cost approximately $10,490.

Recommendation: While both alternatives will reduce flooding, the first alternative is the simplest and the least expensive*.*

Problem Area TC-5: Jerry Smith Road Secondary Drainage System Maintenance

Problem Definition:

Hillsborough County East Service Unit staff stated that localized flooding occurs along Jerry Smith Road between Endeavor Avenue and O'Griffin Road. One cross culvert conveys floodwater to the east under Jerry Smith Road. This secondary drainage system is not included in the watershed hydraulic/hydrologic model. Upon field investigation it is evident that the cross culvert at this location is completely clogged with silt/debris such that virtually no conveyance capacity exists.



TC-5 Flooding Problem Area Location Map



Jerry Smith Road (u/s)



Jerry Smith Road (d/s)

Alternative Solutions:

Description: The logical solution is for maintenance activities to be performed in this portion of the secondary drainage system. The cross culvert should be cleared of the accumulated silt and debris, including the structure inlets and outlets. The downstream ditch should be graded such that a positive drainage outfall exists (the purchase of a drainage system may be required). Routine maintenance should be performed regularly in this secondary system.

Advantages: Maintaining this secondary system will provide relief from localized flooding along Jerry Smith Road.

Disadvantages: There are no disadvantages associated with this alternative unless land acquisition is necessary and poses a problem.

Effectiveness: This recommended alternative would provide flood relief along Jerry Smith Road. In a maintained state it, is expected that the drainage system will attain the required 25-year level of service. A more detailed analysis of this secondary system is required, including site-specific information, for a quantitative assessment.

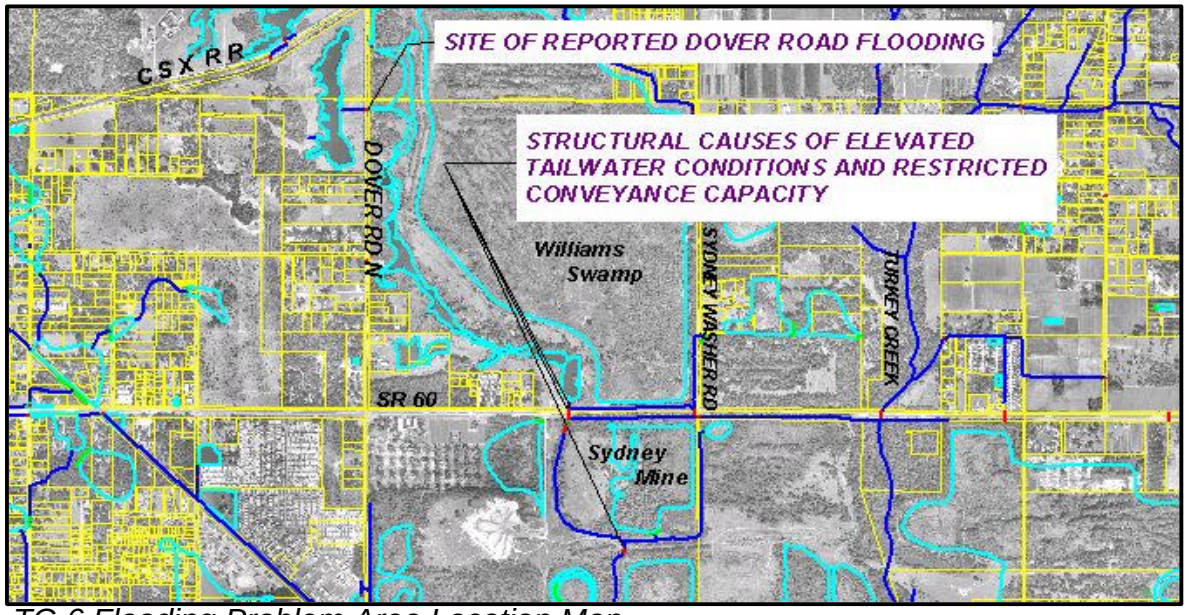
Estimated Cost: The estimated cost for this alternative is $4,900

Recommendation: This is the recommended alternative. No other alternative was analyzed as this problem can be alleviated by maintenance.

Problem Area TC-6: Dover Road

Problem Definition:

Dover Road is a north-south road that extends from Durant Road to Martin Luther King Blvd. Inactive mines border the east side of Dover Road from Durant Road to the Salem Church Road and the west side from SR 60 to Sydney Road. Between SR 60 and Salem Church Road, the Dover Road profile has a sag point, or low spot, where two pipes connect the drainage system and permit flow in a west to east direction. At this sag point, Dover Road experiences frequent road flooding. The hydrologic and hydraulic existing conditions model shows water elevations of 0.54 feet over Dover Road during a 25-year design storm event. Tailwater conditions dominate at this locale and are caused by constricted or obstructed structures at SR 60 and downstream through the Sydney Mine. The full submergence of these structures prevents inspection and determination of hydraulic impediments, if they exist. In order to properly assess possible solutions to the flooding conditions on Dover Road, the structures along this conveyance system need to be accurately surveyed to determine the exact cause of observed flooding conditions and the most effective solution.



TC-6 Flooding Problem Area Location Map

Alternative Solutions:

Alternative 1:

Description: Further information concerning the drainage system and structures need to be acquired, including inverts, sizes, and possible blockages. This will require a de-watering operation in the vicinity of the structures. An informed and intelligent course of action can then be implemented to lower upstream water elevations (Dover Road tailwater conditions) and reduce flooding at Dover Road.

Advantages: Accurately defining the hydraulic system will allow the proper action to be taken to alleviate flooding at Dover Road while restoring the drainage system around the Sydney Mine.

Disadvantages: Detailed information is not available without a de-watering operation.

Effectiveness: This inspection will reveal the nature and cause of the observed flooding conditions so that a remedial action plan can be implemented. Without it, no reliable plan can be undertaken.

Estimated Cost: The estimated cost for the implementation of this alternative is $51,300

Recommendation: This is an “alternative” to gather further information in order to best assess further actions. It is, therefore, the only alternative considered in this report.

13.2.5 English Creek Subwatershed

The County's adopted *Target Level of Service* for the English Creek Subwatershed has a minimum goal of Level 'B' for the 25-year, 24-hour design storm event. Five locations were identified that did not meet the County's minimum *Target Level of Service* criteria based on flood stages predicted by the model (See Table 6.8-4 and Figure 6.8-3). However, each of these locations is a private access road. In terms of the minimum target service levels, these private roads are not within the jurisdiction of the County and therefore it is not the County's responsibility to achieve the minimum Level of Service.

In addition to the LOS deficiency areas that were identified through the modeling of the existing hydrologic and hydraulic conditions, other flooding problem areas were identified based on input received during public meetings or from Hillsborough County Service Unit or historical flooding complaints databases (See Figure 6.8-1). There have been thirteen "flood complaints" made within the English Creek Subwatershed as listed in Table 6.8-1, however no information was provided to describe the nature of the problems. Since the flood complaint database did not record the nature of the flooding problem, these complaints were not addressed. There were also ten Hillsborough County South Service Unit concerns related to road and yard flooding problems. These problem areas were investigated where there was sufficient information provided and alternative measures analyzed. In some cases, further detailed study is needed. In many instances, the problem was related to a maintenance issue and it was added to a list of recommended maintenance needs provided in Chapter 15.

The following discussion details the flooding problems identified in the English Creek Subwatershed, and provides a description of the proposed solutions and alternatives. The locations of these projects are shown in Figure 13.1-1.

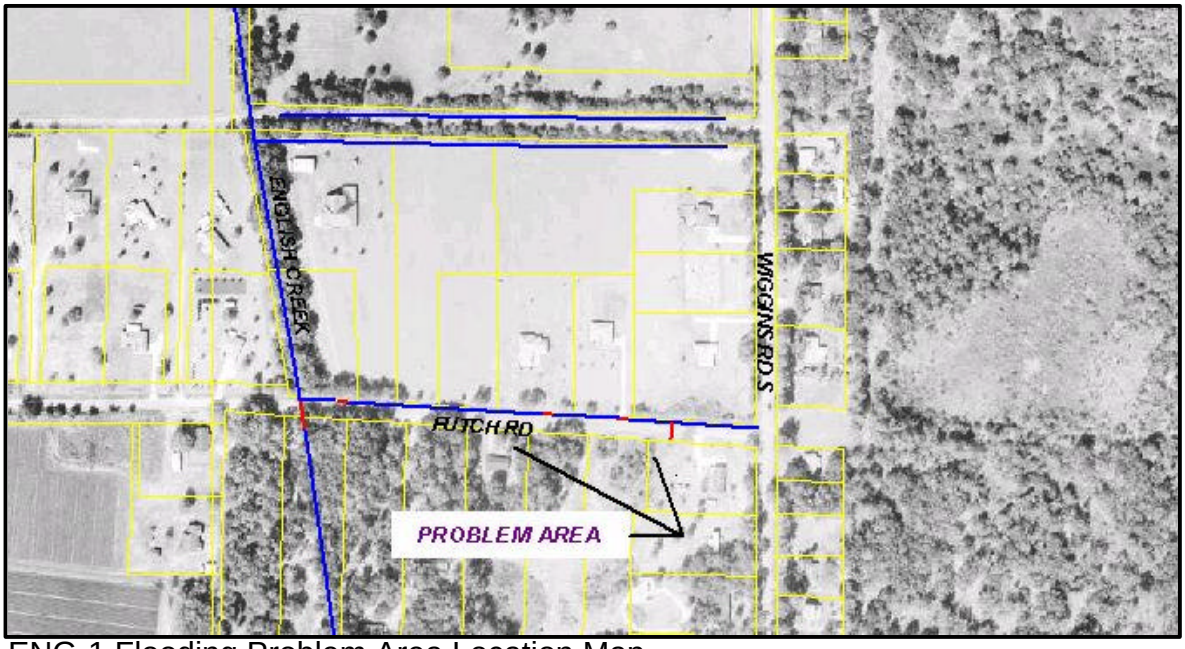
Problem Area ENG-1: Futch Road

Problem Definition:

The East Service Unit has noted a road flooding problem in the upper region of the English Creek drainage basin on Futch Road. Runoff from the subbasin to the north collects in the ditch on the north side of Futch Road and ponds along the east end in the low-lying area near the intersection of Futch and South Wiggins Road. There is a small 15" corrugated HDPE pipe that acts as a cross drain under Futch Road. The collector ditch is large and is sloped towards the east. There is a driveway culvert (twin 12" CMP) at the west-end of the ditch. There are two more driveway culverts towards the east end and these are partially blocked with sediment (see figure below).

Homes on the south side of Futch Road occasionally experience yard and structure flooding. During extreme rainfall events, the ditch fills up and does not have enough outfall capacity. The ditch outfall to English Creek appears to be undersized and the driveway culverts to the east are partially blocked with sediment. Runoff from the north crosses Futch Road and then flows overland in a southwesterly direction towards English Creek. The topography is generally flat, causing a lengthy but natural flowpath.

The location of the flooding problem on Futch Road is part of the secondary drainage system and as such was not specifically modeled as a part of this study. The nearest level of service analysis point is at the model junction 797800, the upstream end of the English Creek culvert at Futch Road, where a 25-year LOS A condition is achieved.



ENG-1 Flooding Problem Area Location Map



*Partially blocked driveway culvert along the north side of Futch Road***.**

Alternative Solutions:

Alternative 1:

Description: This alternative solution, based on available information, is to clear sediment and debris from the two driveway culverts at the east end of the north ditch. In addition, replacement of the small 12" pipes on the west end of the north ditch with a larger structure to promote increased discharge to English Creek during high flow events is recommended. The ditch may need to be re-graded to drain toward the west end of the ditch for a distance of approximately 450 feet, and the cross drain should be blocked. A detailed survey and analysis of this secondary system will be required to ensure proper project design and implementation. The intent of this alternative is to have work occur on the north side of Futch Road within the County's right-of-way in the existing ditch and to convey runoff from high flow events to English Creek rather than across to the south of Futch Road. This will provide relief to property owners while minimizing impacts to the wetlands on the south of Futch Road.

Advantages: Enlarging the culvert under the last driveway is simple and cost effective. By using the existing conveyance system, work can be done in the existing right of way without the need to obtain drainage easements. Environmental impacts would be virtually nonexistent, facilitating the permitting process.

Disadvantages: The natural grade of the northern ditch is to the east. There is also a large tree on the west side of the last driveway crossing, which would require removal in order to install a larger pipe. The ditch may have to be re-graded to promote positive drainage to the west.

Effectiveness: The effectiveness of this alternative solution cannot be predicted here. Alternatives based on the hydrology of the area can be given in general terms only. More detailed survey information and a hydrodynamic model with increased resolution will be necessary to objectively assess this alternative.

Estimated Cost: This alternative will cost approximately $9,230.

Alternative 2:

Description: To relieve the homes on the south side of Futch Road from flooding conditions, in this alternative a ditch system would be constructed along the south side of Futch Road and graded for positive drainage from Wiggins Road to an outfall at English Creek. In this scenario, part of the runoff will be diverted along the roadside channel instead of along the natural flow path. This alternative may work best in conjunction with Alternative 1, but without blocking the Futch Road cross drain. Depending on the location of the right-of-way boundary on the south side of Futch Road, it is assumed for this analysis that easements will need to be purchased. The ditch will be approximately 900 feet long and five driveway culverts will need to be installed.

Advantages: This will double the capacity of the existing ditch on the north side of Futch Road, thus providing further relief for flooded property owners. Construction of a roadside ditch and three driveway culverts is a straightforward project.

Disadvantages: It remains to be determined if there is sufficient right-of-way to construct another ditch without purchasing an additional drainage easement. Permitting may be more difficult and expensive as there are probably wetlands involved.

Effectiveness: The effectiveness of this alternative cannot be determined without further data and analysis.

Estimated Cost: The estimated cost for this alternative is $56,300.

Recommendation: Alternative 1 is the recommended alternative, although a more detailed study is necessary to determine if it is efficacious.

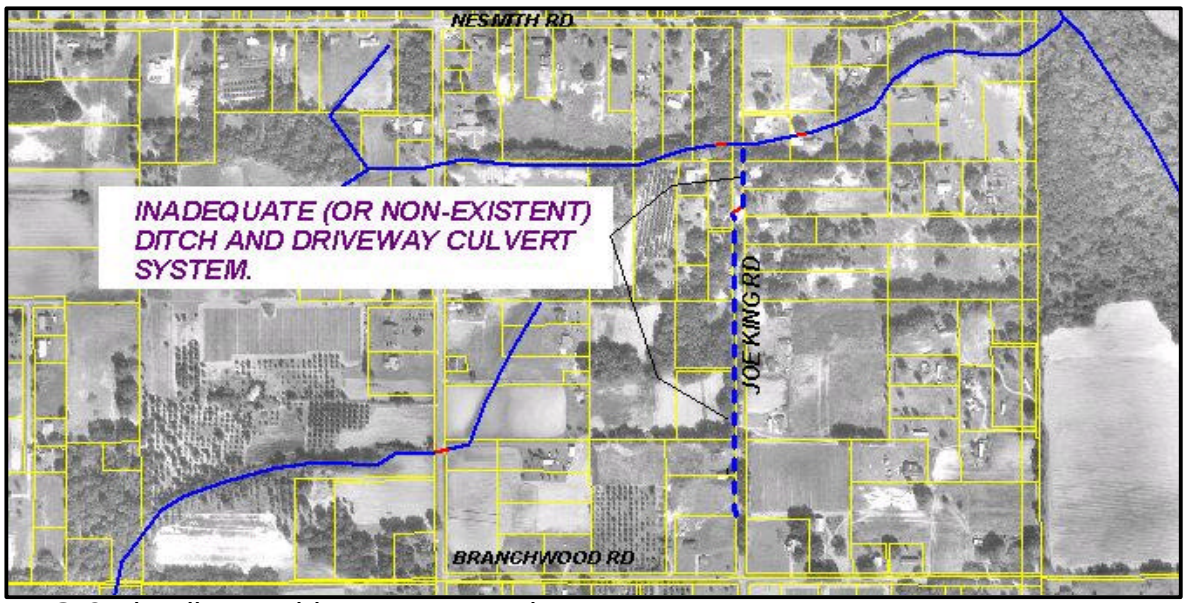
Problem Area ENG-2: Joe King Road

Problem Definition:

The Hillsborough County East Service Unit indicated there are flooding problems along Joe King Road. This is supported by documented incidents of roadway flooding. Joe King Road does not have a completed tertiary drainage system in place. A ditch system is intact along a portion of the road but is not continuous and therefore does not relieve the localized flooding. This is a rural area with mixed low-density residential, undeveloped land, and agriculture land use.

Since only primary and some secondary systems of the major tributaries of the Alafia River were modeled, the closest corresponding point in the existing conditions model is at Junction 791640. This is the upstream node of Tributary 1622, which crosses Joe King Road through a 36" CMP culvert. The level of service for this location is a 25-year LOS A. The road elevation is 98.8 feet and the water surface elevation for a 25-year storm event is 97.3 feet NGVD.

Field investigation unearthed a 12" by 18" corrugated metal pipe cross drain south of Tributary 1622. (The downstream end of which is shown in the following picture.)



ENG-2 Flooding Problem Area Location Map



Joe King Road near Tributary 1622

The County has planned an improvement project in this area to optimize drainage within the right of way. According to County personnel, it is currently unfunded and thus does not yet have a project number nor does it appear on the County's project summary list. However, it should be funded and implemented sometime in 2005-2006.

Alternative Solutions:

Alternative 1:

Description: In this alternative, the ditch/swale system would be rehabilitated and completed so that runoff can be conveyed to Tributary 1622 at the north end of Joe King Road. This will comprise approximately 1500 linear feet of ditch. Necessary drainage easements would need to be obtained along Joe King Road. Driveway culverts would be replaced or installed and should be made of reinforced concrete pipe to prevent deformation. The 12" by 18" corrugated metal pipe serving as a cross drain, south of the tributary, should be replaced by a larger reinforced concrete pipe.

Advantages: Constructing the tertiary drainage system will provide a maintainable conveyance system for stormwater runoff and relieve localized flooding conditions.

Disadvantages: Without a more detailed survey of the existing road with respect to the limits of the right-of-way, the extent of easement (land) acquisition is difficult to predict. See Alternative 2.

Effectiveness: The effectiveness of alternative solutions cannot be predicted here. Alternatives based on the hydrology of the area can be given in general terms only. More detailed survey information and a hydrodynamic model with increased resolution will be necessary for a quantitative assessment.

Estimated Cost: This alternative would cost approximately $31,630.

Alternative 2:

Description: Although the conveyance system is partially constructed on the west side of Joe King Road, without more detailed survey data with respect to the limit of the right-of-way, the ease and extent of easement acquisition is difficult to determine within the scope of this study. However, further investigation may show construction of the ditch on the east side of Joe King Road is preferable. If so, in this alternative the cross drain would be installed farther upstream along this tertiary drainage system and stormwater runoff conveyed along the east side of the road to outfall at Tributary 1622.

Advantages: See Alternative 1.

Disadvantages: See Alternative 1.

Effectiveness: See Alternative 1.

Estimated Cost: This alternative would cost approximately $31,630.

Recommendation: Alternative 1 is the recommended alternative although a more detailed study is necessary to determine if it is the most cost-effective and implementable.

Problem Area ENG-3: Jim Johnson Loop

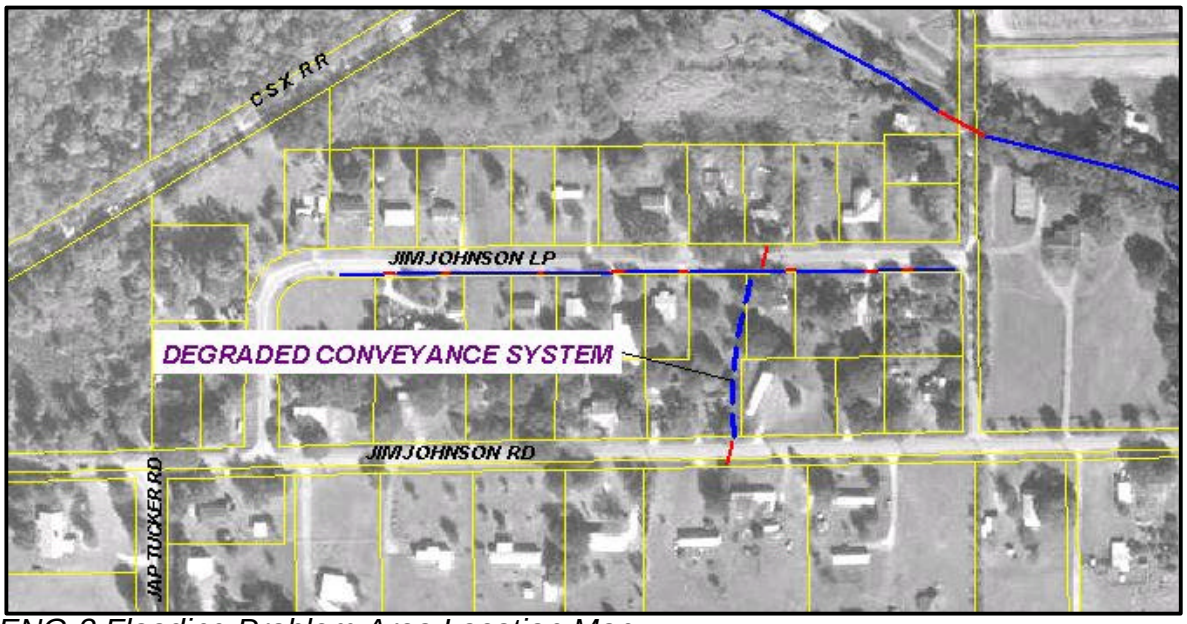
Problem Definition:

Jim Johnson Loop is a small neighborhood formed by a loop ending at both ends on Jim Johnson Road just east of Jap Tucker Road. The tertiary drainage system in this neighborhood is in need of repair and re-establishment. The neighborhood is generally on high ground with most of Jim Johnson Loop draining to the north. Homes directly along Jim Johnson Road drain toward the east. This area was identified by the Hillsborough County East Service Unit as having localized flooding problems.

There is a 12” RCP cross drain under Jim Johnson Road that conveys drainage in a northward direction toward the Jim Johnson Loop cross drain, a 20” CMP. This water is joined by runoff from along Jim Johnson Loop that is routed through a ditch and driveway culvert

system to the upstream side of the cross drain at Jim Johnson Loop. After crossing Jim Johnson Loop, a 15" DIP flows to the north.

The drainage system in this area was evaluated by the County's stormwater management team in April of 1996. Their recommendation was to obtain a 275-foot easement, re-establish 275 feet of ditch, and replace 300 feet of 24" pipe from west to east along the north side of the road. The project (CIP # 47126) has a project completion date of 1/15/02.



ENG-3 Flooding Problem Area Location Map



Drainage system at Jim Johnson Loop

It should be noted that this is a tertiary drainage system and as such is a localized drainage issue. It was not included specifically in the hydraulic and hydrologic watershed model. The nearest junction, 792160, is located at the outfall of the neighborhood drainage system. This location provides a 25-year LOS A according to model results.

Alternative Solutions:

Alternative 1:

Description: The solution described above is viable in combination with repaired driveway culverts and ditch restoration throughout the neighborhood. Specifically, 8 driveway culverts will need clearing, repair and/or replacement, and the ditch system along the south side of the loop will need to be cleared of heavy vegetation and possible repair to ensure positive discharge.

Advantages: This will provide a conveyance system with a positive outfall for local drainage and should reduce localized flooding. Permitting should not be difficult as this is primarily a re-construction of a stormwater system through a developed neighborhood and should have little environmental impact.

Disadvantages: Since the ditch between Jim Johnson Road and Jim Johnson Loop is not along a road, periodic maintenance will require additional effort.

Effectiveness: The effectiveness of alternative solutions cannot be predicted here. Alternatives based on the hydrology of the area can be given in general terms only. More detailed survey information and a hydrodynamic model with increased resolution will be necessary for a quantitative assessment.

Estimated Cost: This alternative would cost approximately $55,840.

Recommendation: Alternative 1 is the recommended alternative.

Problem Area ENG-4: South Wiggins Road

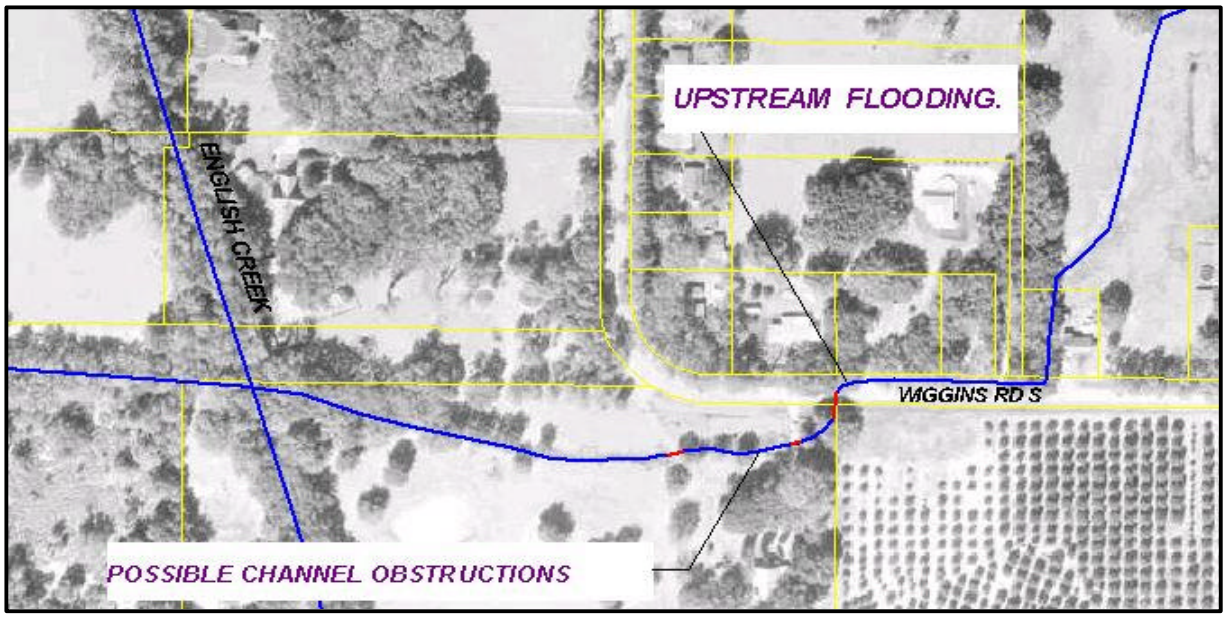
Project Definition:

South Wiggins Road is a north-south connector road between S.R. 92 and Sparkman Road. The headwaters of English Creek begin just west of South Wiggins Road, south of S.R. 92. The creek runs roughly parallel with S. Wiggins Road until it crosses south of Shepard Road and north of Cason Road. As it parallels S. Wiggins, several small tributaries feed to the creek. One of these tributaries begins north of Kirkland Road, meanders in a southwesterly direction, and crosses S. Wiggins as S. Wiggins Road takes a sharp bend to the east. The tributary joins with English Creek west of S. Wiggins Road, as shown in the figure below. This unnamed tributary crosses under S. Wiggins Road through a large 4.5'x17.5' box culvert. The channel then passes through a fenced private property. The tributary joins with English Creek farther west on this parcel.

Numerous complaints and a service unit concern have indicated that the flooding concerns at the South Wiggins Road crossing have become more intensified over the past few years. Channel restrictions along the downstream channel have been identified as the cause.

Access to the site, located on private property, was denied to Parsons staff to ascertain specific cause of the reported flooding problems.

The road elevation is 132.7 feet NGVD and the predicted peak water surface elevation using the existing conditions model with an unobstructed channel for a 25-year storm event is 129.7 feet. However, upstream residents adamantly assert yard and road flooding are an issue.



ENG-4 Flooding Problem Area Location Map



Inaccessible channel with possible obstructions.

Alternative Solutions:

Alternative 1:

Description: Access to the site is required. Regulatory agencies should inspect the unnamed tributary. Unpermitted channel obstructions and excessive vegetation should be removed. Additionally, the County should purchase an easement from the property owners along the channel for inspection and maintenance purposes. This will prohibit alterations of the channel by private citizens.

Advantages: Removal of downstream obstructions will relieve upstream flooding problems. Purchasing an easement along the tributary will allow future access and may facilitate the inspection process.

Disadvantages: Acquiring access to inspect the tributary may require legal processes.

Effectiveness: Model results indicate that an unrestricted downstream channel will achieve a 25-year LOS A condition in the upstream reaches.

Estimated Cost: The implementation of this alternative would cost approximately $41,970

Recommendation: Alternative 1 is the recommended alternative.

13.2.6 North Prong Alafia River Subwatershed

The County's adopted *Target Level of Service* for the North Prong Alafia River Subwatershed is a minimum goal of Level 'B' for the 25-year, 24-hour design storm event. There are two (2) locations within the North Prong Alafia River Subwatershed where the County's minimum acceptable level of service criteria are not met (See Table 6.9-5 and Figure 6.9-3). Of these two (2) locations, none are within the Hillsborough County improved public roadways or provide flooding to existing structures. Therefore, no alternatives were analyzed to provide flood protection for the LOS deficiencies that were identified. It should also be noted that only that portion of the North Prong Alafia River Subwatershed that lies within Hillsborough County was considered in this analysis.

In addition to the LOS deficiency areas that were identified through the modeling of the existing hydrologic and hydraulic conditions, flooding problem areas were identified based on input received during public meetings or from Hillsborough County Service Unit or historical flooding complaints (See Figure 6.9-1). Only one historic flooding complaint in the County's database is located within the North Prong Alafia River Subwatershed, However, no information was provided to describe the nature of the problem. Therefore, no flood control alternatives were considered in the North Prong Alafia River Subwatershed.

13.2.7 South Prong Alafia River Subwatershed

The County's adopted *Target Level of Service* for the South Prong Alafia River Subwatershed is a minimum goal of Level 'B' for the 25-year, 24-hour design storm event. There are nineteen (19) locations within the South Prong Alafia River Subwatershed where the County's minimum acceptable level of service criteria are not met (See Table 6.10-5 and Figure 6.10-3). Of these nineteen (19) locations, only one constitutes a LOS deficiency for a Hillsborough County improved public roadway. The LOS deficiency is located at East Keysville Road north of Welcome Road. It is characterized as Level C which means that the depth of flooding at this location is greater than or equal to six (6) inches and less than 12 inches.

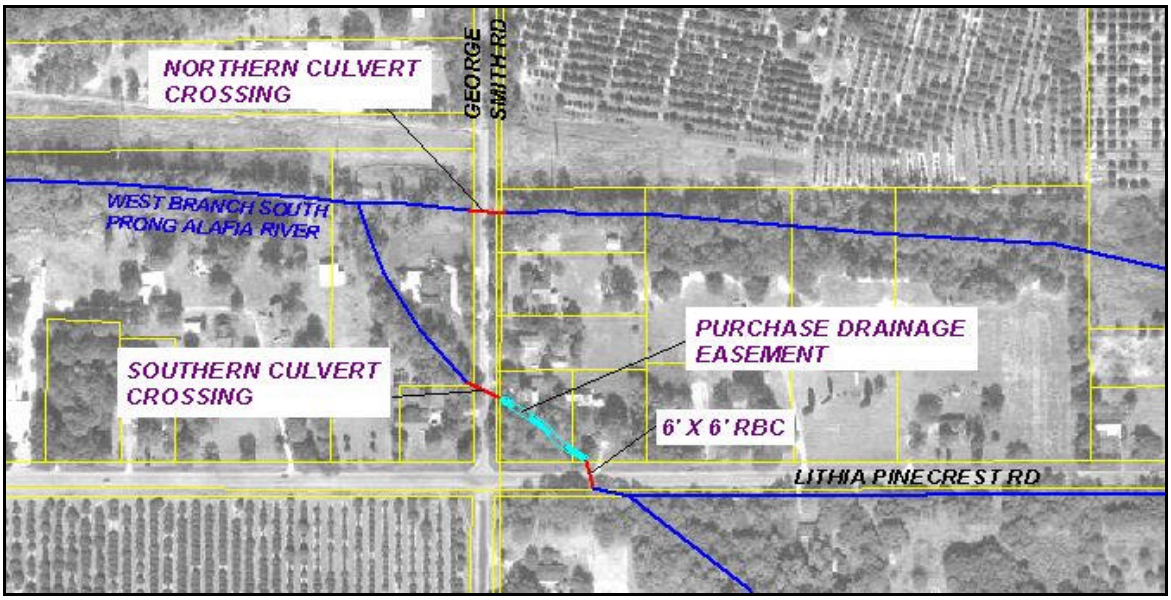
In addition to the LOS deficiency areas that were identified through the modeling of the existing hydrologic and hydraulic conditions, other flooding problem areas were identified based on input received during public meetings or from Hillsborough County Service Unit or historical flooding complaints databases (See Figure 6.10-1). These problem areas were investigated where there was sufficient information provided and alternative measures analyzed. In some cases, further detailed study is needed. In many instances, the problem was related to a maintenance issue and it was added to a list of recommended maintenance needs provided in Chapter 15.

The following discussion details the flooding problems identified in the South Prong Alafia River Subwatershed, and provides a description of the proposed solutions and alternatives. The locations of these projects are shown in Figure 13.1-1.

Problem Area S_Prong-1: George Smith Road and Lithia Pinecrest Road

Problem Definition:

The Hillsborough County East Service Unit staff expressed maintenance concerns along George Smith Road north of Lithia Pinecrest Road. Two culvert crossings convey stormwater runoff westerly under George Smith Road, and a third culvert crossing conveys stormwater runoff northerly under Lithia Pinecrest Road (see figure below). This conveyance system was part of the existing conditions modeling effort and the results indicated that all three crossings met the County's flood control LOS protection requirements and are listed as LOS A for the 25-year storm event. It should be noted that, in the existing conditions model simulation, it was assumed that these pipes are completely unobstructed. During field investigation, however, it was observed that sedimentation problems exist at these locations.



S_PRONG-1 Flooding Problem Area Location Map

Northern Culvert Crossing at George Smith Road: One 44" x 72" corrugated metal pipe conveys stormwater runoff westerly underneath George Smith Road. This crossing is located approximately 725 feet north of Lithia Pinecrest Road. The head loss through at this culvert crossing is 3.64 feet for the 25-year storm event. The road overtop weir elevation of George Smith Road at the culvert crossing is 114.02 feet NGVD and the 25-year storm flood stage elevation at the upstream side of the culvert (Junction Number 770565) is 113.62 feet NGVD. Therefore, no overtopping of the roadway occurs if the culvert is maintained unobstructed, and a 25-year LOS A is attained at this location. However, based on field investigations, it was observed that this pipe is nearly 50 percent silted, leaving approximately a 22" opening available for conveyance**.**



George Smith Rd – Northern Culvert Crossing (u/s)



George Smith Rd – Northern Culvert Crossing (d/s)

Southern Culvert Crossing at George Smith Road: Two 59" x 81" CMPA's convey the flow in the West Branch South Prong Alafia River northwesterly at George Smith Road, approximately 250 feet north of Lithia Pinecrest Road. The head loss at these culverts is 2.58 feet for the 25-year storm event. The road overtop weir elevation of George Smith Road at this location is 114.22 feet NGVD and the water surface elevation at the upstream side of the structures (Junction Number 770570) is 113.65 feet NGVD. Therefore, no overtopping of the roadway occurs if the culvert is maintained unobstructed, and a LOS A is attained at this location. However, based on field investigations, it was observed that these pipes are nearly 70 percent silted, leaving only an 18" opening available for conveyance (see figure below).



George Smith Rd – Southern Culvert Crossing (u/s)



George Smith Rd – Southern Culvert Crossing (d/s)

Channel between George Smith Road and Lithia Pinecrest Road: The channel upstream of the southern culvert crossing is extremely silted and overgrown with nuisance species as can be seen in the pictures below. This ditch crosses through a private property where the homeowner has denied service unit personnel access for routine ditch maintenance activity.



Channel between Lithia Pinecrest Road and George Smith Road Southern Culvert Crossing.



Channel between Lithia Pinecrest Road and George Smith Road Southern Culvert Crossing.

Lithia Pinecrest Road Culvert Crossing: The 6' x 6' concrete box culvert at Lithia Pinecrest Road, located upstream of the previously discussed ditch, has slightly overgrown vegetation and accumulated debris at inlet and outlet locations (see figure below). The existing conditions model identifies this location as a LOS A for the 25-year storm event.



Lithia Pinecrest Rd 6' x 6' BC (d/s)



Lithia Pinecrest Rd 6' x 6' BC (u/s)

Alternative Solutions:

Alternative 1:

Description: This alternative solution is to provide maintenance on a regular basis. Specific locations of maintenance deficits are as follows:

Northern Culvert Crossing at George Smith Road: It is recommended that the 44" x 72" CMPA be cleared of silt and debris. Additionally, the upstream and downstream channels should be graded to remove accumulated sediment and debris, and to provide a positive hydraulic gradient.

Southern Culvert Crossing at George Smith Road: It is recommended that the double 59" x 81" CMPA's be cleared of silt and debris. Additionally, the upstream and downstream channels should be graded, to remove accumulated sediment and debris, and provide a positive hydraulic gradient. Cleaning of the upstream channel has posed problems to County's service unit staff in the past and will be addressed below.

Channel between George Smith Road and Lithia Pinecrest Road: The Hillsborough County East Service Unit staff stated that it is useless to clear the southern culvert crossing since they do not have access to clean and re-grade the upstream channel. It is recommended that the County purchase a drainage easement between the southern culvert crossing and the Lithia Pinecrest Road culvert crossing such that routine maintenance can be performed.

Lithia Pinecrest Road Culvert Crossing: It is recommended that the inlet and outlet of this 6' x 6' BC be cleared of sediment and debris. Additionally, any silt captured within the structure itself should be removed.

Advantages: Maintenance of this primary drainage system will allow the system to perform as designed and a drainage easement will allow County staff to perform regularly scheduled maintenance. In a maintained state, these structures should provide the required 25-year flooding level of service protection.

Disadvantages: Considering the owner's unwillingness to allow maintenance access, the acquisition of a drainage easement may be difficult.

Effectiveness: This recommended alternative will improve the conveyance capacity of the system to meet the 25-year level of service requirement as well as provide access for maintenance.

Estimated Cost: This alternative would cost approximately $24,200 to implement.

Recommendation: The recommended alternative consists of maintenance and additional easement acquisition. No other alternatives were analyzed.

Problem Area S_Prong-2: East Keysville Road Bridge Span

Problem Definition:

The existing conditions model indicates excessive flooding of Keysville Road north of Welcome Road, where a single span concrete bridge conveys the westerly flow of Mizelle Creek. During a 25-year storm event floodwater overtops East Keysville Road at a depth of 0.55 feet. The road overtop weir elevation of East Keysville Road at the culvert crossing is 77.8 feet NGVD. The water-surface elevation at the downstream side of the bridge (Junction Number 770740) is 78.35 feet NGVD and is 76.05 feet NGVD at the downstream side of the bridge (Junction Number 770738). The head loss at the bridge is determined to be 2.30 feet.



S_PRONG-2 Flooding Problem Area Location Map

As seen in the two pictures below, the bridge is extremely silted, thus restricting its conveyance capacity. The silting at the bridge was accounted for in the hydraulic/hydrologic model, and this restriction generates a flooding LOS C based on the 25-year storm event.



East Keysville Rd Bridge span (u/s)



East Keysville Rd Bridge span (u/s)

Alternative Solutions:

Alternative 1:

Description: This alternative solution is to dredge the accumulated silt and restore the bridge to its design condition. It is estimated that approximately 150 cubic yards (CY) of silt will need to be excavated to restore the bridge to its designed capacity. This would yield an effective opening of 161 square feet (SF) and reduce the peak flood elevation by 0.75 feet, thus achieving an acceptable level of service. The following table compares the results of the existing conditions model to those of this alternative. It can be seen from this table that no adverse downstream effects are created from this alternative.

Junction Number	*Location*	*Top of Road Elevation*	*Existing 25-yr WSE (ft NGVD)*	*Alternative 1 25-yr WSE (ft NGVD)*
770708	Walter Hunter Rd Bridge (d/s)	-	57.99	58.01
770710	Walter Hunter Rd Bridge (u/s)	58.60	58.18	58.20
770728	-	-	66.85	66.86
770730	-	-	67.05	67.06
770738	Keysville Rd Bridge (d/s)	-	76.05	76.06
770740	Keysville Rd Bridge (u/s)	77.80	78.35	77.60

Advantages: Restoring this bridge structure to its initial design capacity will achieve the required 25-year flood protection LOS criteria with no adverse impacts upstream or downstream, at minimal cost.

Disadvantages: There are no disadvantages associated with this alternative.

Effectiveness: This recommended solution would improve the level of service at this location to LOS A for the 25-year storm event.

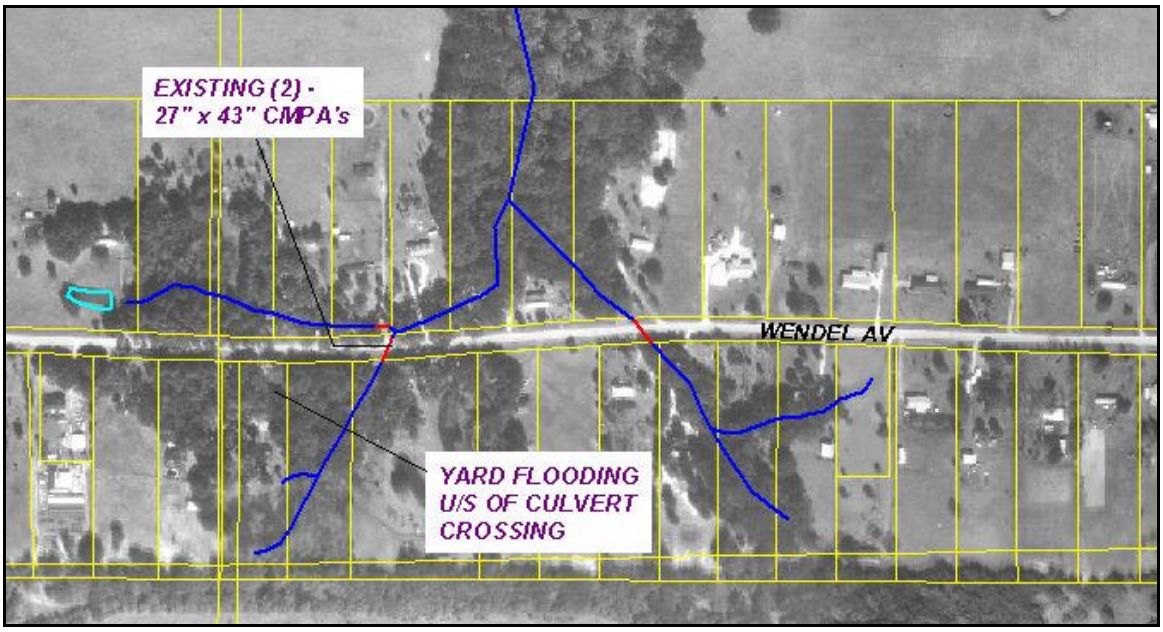
Estimated Cost: The estimated capital outlay for this alternative would be $3,200.

Recommendation: Alternative 1 is the recommended solution. No other alternative was analyzed as this problem can be alleviated by maintenance.

Problem Area S_Prong-3: Wendel Avenue Drainage Improvements

Problem Definition:

Hillsborough County South Service Unit staff stated that residents upstream of Wendel Avenue culvert crossing experience chronic yard flooding problems (see figure below). Houses in this area are constructed in a low-lying topographic area comprised of poorly drained soils with high ground water table during the rainy season. Two 27" x 43" CMPA's convey stormwater runoff northerly under Wendel Avenue. No road flooding conditions were identified here, but the existing culverts are constrictive and contribute to the yard flooding problem.



S_PRONG-3 Flooding Problem Area Location Map



Wendel Avenue culvert crossing (u/s 2 – 27" x 43" CMPA's)

Alternative Solutions:

Alternative 1:

Description: This alternative consists of the replacement of the existing twin – 27" x 43" CMPA's with 3 – 29" x 45" ERCP's at the same gradeline. Replacing these two culverts with three slightly larger pipes would reduce the flood elevation at the upstream side of the structures from 89.86 feet NGVD to 89.38 feet NGVD, a reduction of 0.48 feet in the flood stage elevation of the 25-year storm event.

Advantages: Replacing the existing two pipes with three slightly larger ones would provide residents upstream of this culvert crossing with some drainage relief. Nearly a six-inch reduction in flood elevation is achieved via this alternative, with no adverse downstream impacts.

Disadvantages: Since there is no roadway flooding at this location along Wendel Avenue, this "yard" flooding does not necessarily fall under the County's requirements for flood protection.

Effectiveness: This alternative reduces the flood elevation by 0.48 feet, thus providing drainage relief for some of the flooded yards upstream with no adverse impacts downstream or to wetland systems.

Estimated Cost: The estimated cost of this alternative would be $36,500.

Alternative 2:

Description: This alternative is a "no action" plan that acknowledges that the flooding problem does not constitute a flooding LOS violation at Wendel Avenue itself.

Advantages: Doing nothing at this location will save the County capital funds that could be spent on a more strategic project identified in the watershed management plan.

Disadvantages: Doing nothing at this location does not provide any drainage relief for the residents upstream of this culvert crossing.

Effectiveness: This alternative does not provide any flood relief to the local residents.

Estimated Cost: There would be no initial costs for this alternative.

Recommendation: Alternative 1 is the recommended solution. This alternative is preferred because it provides local residents flood relief, and 25-year flood stage elevation is reduced by six inches.

13.2.8 Alafia River Main Stem Subwatershed

The County's adopted *Target Level of Service* for the Alafia River Main Stem Subwatershed is a minimum goal of Level 'B' for the 25-year, 24-hour design storm event. There are twelve (12) locations identified within the Alafia River Main Stem Subwatershed where the County's minimum acceptable level of service criteria are not met (See Table 6.11-5 and Figure 6.11-3). Of these twelve (12) locations, eight constitute a LOS deficiency for a Hillsborough County improved public roadway.

In addition to the LOS deficiency areas that were identified through the modeling of the existing hydrologic and hydraulic conditions, other flooding problem areas were identified based on input received during public meetings or from Hillsborough County Service Unit or historical flooding complaints databases (See Figure 6.11-1). These problem areas were investigated where there was sufficient information provided and alternative measures analyzed. In some cases, further detailed study is needed. In many instances, the problem was related to a maintenance issue and it was added to a list of recommended maintenance needs provided in Chapter 15.

The following discussion details the flooding problems identified in the Alafia River Main Stem Subwatershed, and provides a description of the proposed solutions and alternatives. The locations of these projects are shown in Figure 13.1-1.

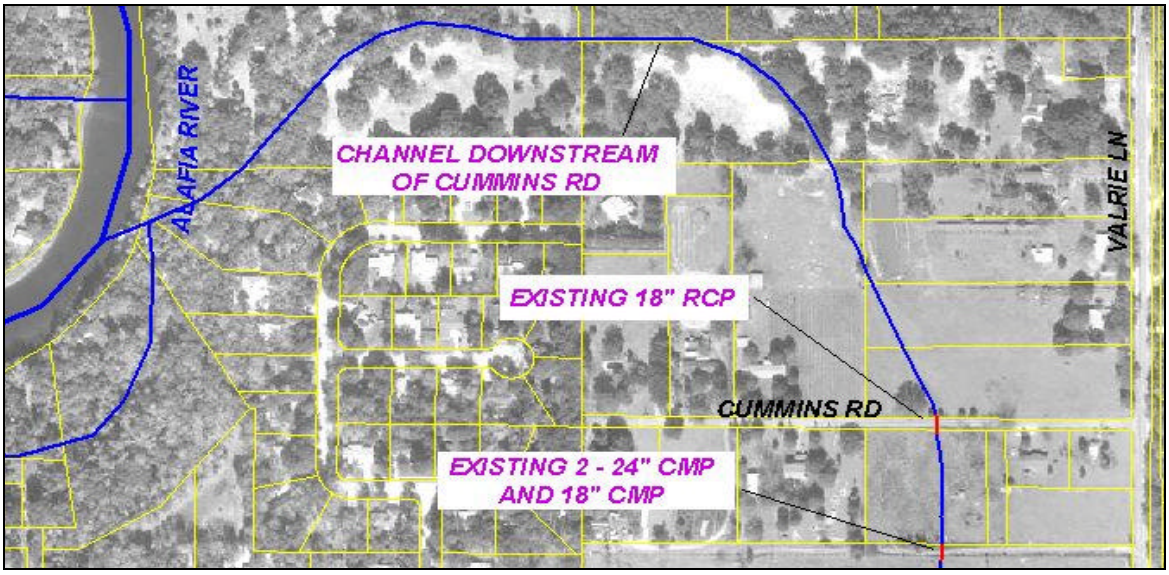
Problem Area AR-1: Cummins Road

Problem Definition:

Cummins Road is located off Valrie Lane north of McMullen Loop in Riverview. It is an extremely narrow paved county-owned road that will experience 0.6 feet of flooding during the 25-year design storm event. The Cummins Road elevation is 22.04 ft NGVD and the 25-year existing condition flood elevation is 22.64 ft NGVD. The tributary that flows through the culvert underneath Cummins Road from the south originates from a wetland that is now part of the Riverglen subdivision stormwater treatment system. This flooding problem has been clearly

documented by a county constituent, whose property and dirt driveway also become completely inundated with floodwaters just upstream (south) of Cummins Road.

Recent residential development upstream, including the Riverglen subdivision, has compounded the problem. The 18" RCP is no longer able to convey the resulting higher flows during large storm events. The hydrologic/hydraulic model indicates flooding at this location, which corresponds with a recent flooding complaint received at the first Hillsborough County Alafia Public Meeting. The constriction at this cross drain is accompanied with sedimentation within the downstream channel. The channel is now undefined, very shallow and ineffective for floodwater conveyance. Additionally, even more development is under construction upstream that may exacerbate this problem.



AR-1 Flooding Problem Area Location Map



Cummins Road during Tropical Storm Gabrielle

Alternative Solutions:

Alternative 1:

Description: This alternative comprises the replacement of the existing 18" RCP with 3 - 24"x38" ERCP's and the raising of Cummins Road to an elevation of 22.60 ft NGVD.

Advantages: This alternative should be easily permittable. No easements should have to be purchased, and it does not raise downstream flood elevations. This is the least expensive alternative.

Disadvantages: The major disadvantage of this alternative is that, without improving the downstream channel, the new pipes will continue to silt up and become clogged because the invert of the downstream channel is higher than the invert of the existing culvert.

Effectiveness: This alternative achieves the 25-year LOS flood protection and eliminates flooding over Cummins Road. This alternative reduces the flood elevation upstream of Cummins Road from 22.64 ft NGVD to 22.51 ft NGVD and achieves a flooding LOS A for Cummins Road.

Estimated Cost: This alternative would cost approximately $27,200.

Alternative 2:

Description: This alternative is the same as Alternative 1 with the additional improvement of the downstream channel by clearing a 1-foot deep swale with an 8-foot bottom width and 6 to 1 sideslopes for the immediate downstream channel, and excavating a 4-foot shelf on one side of the channel further downstream. The immediate downstream channel must be improved to prevent sediment deposition that would occur in the new culverts. Further downstream, the channel would be improved to reduce peak flood elevations that would be raised by the immediate downstream channel improvements.

Advantages: With this alternative, the new culverts would not silt up and become clogged with sediment. Peak flood elevations are reduced at Cummins Road and in the downstream channel. This alternative should be permittable.

Disadvantages: An easement would have to be purchased to make the downstream channel improvements feasible. This alternative is more costly than Alternative 1.

Effectiveness: This alternative would reduce the flood elevation at Cummins Road from 22.64 ft NGVD to 22.26 ft NGVD, thus achieving a 25-year flooding LOS A.

Estimated Cost: This alternative would cost approximately $116,600.

Alternative 3:

Description: In this alternative, the existing 18" RCP would be replaced with 2 - 34"x53" ERCP's and Cummins Road raised to an elevation of 23.0 ft NGVD. The downstream channel improvements from Alternative 2 would be included with this alternative.

Advantages: This alternative should be permittable. Downstream flood elevations are not increased. This alternative also keeps the culverts from becoming clogged with sediment.

Disadvantages: An easement would have to be purchased to make the downstream channel improvements feasible. Cummins Road would have to be raised to elevation 23.0 ft NGVD, 0.4 feet higher than Alternative 2, to accommodate the larger pipe size.

Effectiveness: This alternative achieves the 25-year LOS flood protection and eliminates flooding over Cummins Road. Alternative 3 reduces the flood elevation upstream of Cummins Road from 22.64 ft NGVD to 22.41 ft NGVD and a flooding LOS A would be achieved with this alternative.

Estimated Cost: This alternative will cost approximately $116,600.

Recommendation: Alternative 2 is the recommended alternative. This alternative is preferred because, although the project cost is higher than Alternative 1, it is a more permanent solution. By improving the downstream channel, the new culverts should maintain their full hydraulic capacity since the potential for clogging with sediment will be reduced. Also, less maintenance will be needed. The cost difference between Alternative 2 and Alternative 3 is negligible but since Alternative 2 brings the flood elevation down 0.15 feet more than Alternative 3, it is preferred.

Problem Area AR-2: Greenhills Drive

Problem Definition:

A pond located at the Greenhills subdivision is a natural sinkhole converted to a permitted stormwater pond. The subdivision is located off of Miller Road directly across from the Buckhorn Springs Golf & Country Club. Flooding across Greenhills Drive from the sinkhole (stormwater pond), located on the north side of the street, is indicated by the flood control model to be in excess of one foot for the 25-year storm event. The road elevation is 55.2 ft NGVD and the 25-year flood elevation is 56.55 ft NGVD. This pond collects stormwater runoff from the Greenhills subdivision and lies within a closed basin, has no positive outfall, and is undersized for its drainage basin. This flooding problem was apparent during Tropical Storm Gabrielle in September 2001, when the pond overflowed and flooded the road and property to the south. A pump station had been installed in the previous years by the County to help control the flood elevation in the pond. However, the pump is insufficient to control the flood elevation to a LOS compliant level. An 18" RCP cross drain under Greenhills Drive connects the pond to a smaller sinkhole on the south side of the road, but this culvert has been blocked by either the local property owner or the County.



AR-2 Flooding Problem Area Location Map



Greenhills Drive during Tropical Storm Gabrielle

Alternative Solutions:

Alternative 1:

Description: Storage could be added to alleviate the flooding. Alternative 1 is for the County to purchase a portion of the parcel to the south of the sinkhole pond. This pond has enough available storage to eliminate flooding over Greenhills Drive. The Greenhills pond would be connected to the newly acquired sinkhole pond by unblocking the existing 18" RCP under Greenhills Drive. This would allow the excess from the Greenhills pond to flow under the road to another small sinkhole immediately south of Greenhills Drive. The water would then be routed from the small sinkhole to the newly acquired sinkhole pond via 260 LF of 18" RCP. These connections would equalize the peak flood elevations in the three ponds, thereby eliminating the LOS deficiency.

Advantages: This alternative should be easily permittable. The easement for the equalizer pipe should be easy to obtain since this alternative relieves flooding on the owner's property.

Disadvantages: This alternative depends on the ability to purchase the property and/or to purchase a drainage easement for the pond.

Effectiveness: This alternative achieves a 25-year flood protection LOS A for Greenhills Drive by reducing the maximum flood elevation in the Green Hills pond from 56.55 ft NGVD to 54.08 ft NGVD. This alternative also relieves flooding on the property to the south of Greenhills Drive. Although Alternative 1 raises the flood elevation in the pond (sinkhole) to the south from 52.73 ft NGVD to 54.01 ft NGVD, the water is still contained within the banks of the pond.

Estimated Cost: The capital cost of this alternative would be $80,800.

Alternative 2:

Description: Like Alternative 1, Alternative 2 involves the purchase of the west part of the property with the large sinkhole pond. Also like Alternative 1, water would be routed to the small pond just south of Green Hills Drive by unblocking the existing pipe under the road. The County would then construct an overflow ditch instead of an equalizer pipe to the newly acquired sinkhole pond.

Advantages: This alternative should also be easily permittable, as in Alternative 1, to connect the three ponds. The easement for the overflow ditch should be easy to obtain since this alternative relieves flooding on the owner's property. This alternative would not include pipe construction as in Alternative 1.

Disadvantages: This alternative depends on the ability to purchase the property and/or to purchase drainage easements. Also, since the ditch would be over thirty-five feet wide at one point, the size of the required drainage easement would be greater, as well as excavation costs.

Effectiveness: This alternative also achieves a 25-year flood protection LOS A for Greenhills Drive by reducing the maximum flood elevation in the Green Hills pond from 56.55 ft NGVD to 53.89 ft NGVD. This alternative also relieves flooding on the property to the south of Greenhills Drive. Alternative 2 raises the flood elevation in the large sinkhole pond to the south from 52.73 ft NGVD to 53.89 ft NGVD, but the water is still contained within the banks of the pond.

Estimated Cost: This alternative would cost approximately $72,300.

Alternative 3:

Description: Alternative 3 also involves the purchase of the west part of the property with the large sinkhole pond to the south and then installation of an additional pump station. The station would pump to the larger south sinkhole pond.

Advantages: This alternative should also be permittable. The easement for the equalizer pipe should be easy to obtain since this alternative relieves flooding on the owner's property.

Disadvantages: This alternative depends on being able to purchase the pond property and to purchase drainage easements. Also, the new station would have to pump at a rate of five cubic feet per second to solve this flooding problem. This large a pump station would be very costly, especially considering a gravity pipeline (Alternative 1) is a viable solution.

Effectiveness: This alternative reduces the maximum flood elevation from 55.65 ft NGVD to 54.60 ft NGVD and relieves flooding to Green Hills Drive and surrounding properties. Although Alternative 3 does raise the flood elevation in the large sinkhole pond to the south from 52.73 ft NGVD to 54.69 ft NGVD, the water is still contained within the banks of the pond. A 25-year flooding LOS A is achieved with Alternative 3.

Estimated Cost: The estimated capital costs for this alternative would be $180,800.

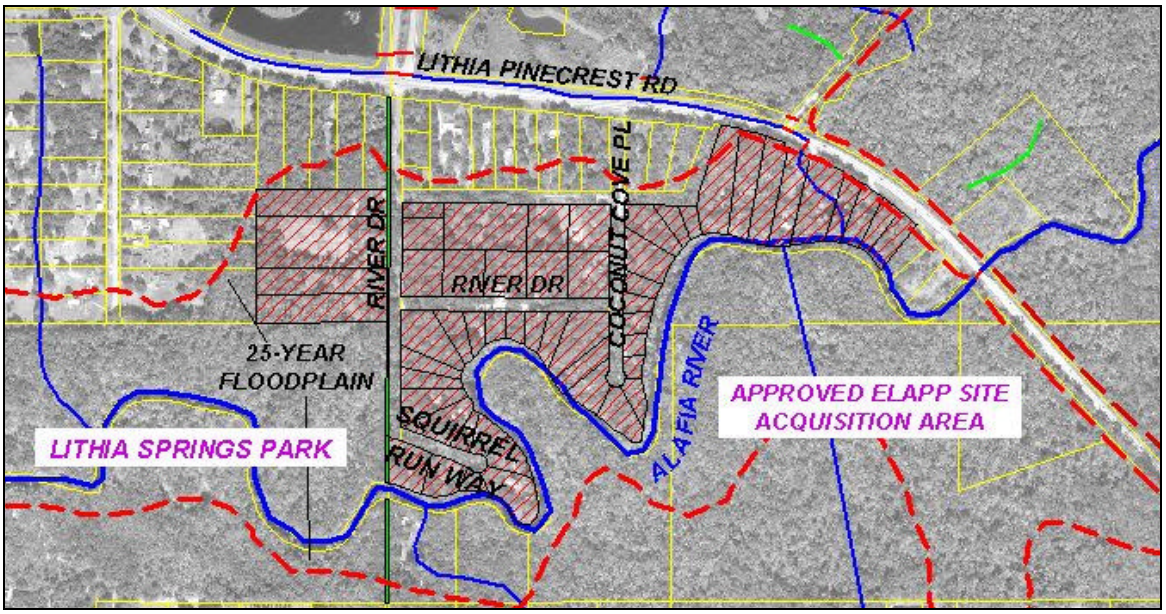
Recommendation: Alternative 1 is the recommended alternative. This alternative is preferred because, although the initial cost is slightly higher than Alternative 2, it would require less maintenance costs. Alternative 1 would also be more desirable for the easement property owner because this alternative would not interfere with the use of his property.

Problem Area AR-3: River Drive & Squirrel Run Way

Problem Definition:

There are four locations south of Lithia Pinecrest Road and north of the Alafia River main channel where flooding LOS deficiencies are identified by model results. The southern ends of Pine Street and Rose Street, most of Coconut Grove Place and River Drive, and all of Squirrel Run Way are estimated to flood with one to seven feet of water during the 25-year storm event. Flooding on these roads and properties is a direct result of the flood elevation in the Alafia River. The 25-year peak flood elevation in the river in this area is 25.25 ft NGVD. Street and property flooding is commonplace in this area during large storm events. There are over fifty privately owned properties in this area that lie within the 25-year floodplain of the

Alafia River. Several flood complaints were received from residents on Squirrel Run Way at the first and second Hillsborough County Alafia Public Meeting for severe and frequent property flooding (3-4 feet). One complaint was also reported for house flooding, even though the home is on eight-foot stilts. Residents commented that the flooding has become more severe in recent years. Two historical flood complaints were also received from this area. Tropical Storm Gabrielle recently flooded out many residents on these streets and realistic alternatives to solve this problem are limited.



AR-3 Flooding Problem Area Location Map



River Drive during Tropical Storm Gabrielle

Alternative Solutions:

Alternative 1:

Description: Alternative 1 is for Hillsborough County to buy 51 properties that lie within the 25-year floodplain and allow the homeowners to either relocate their homes or have them demolished.

Advantages: This alternative has the advantages of no permitting or construction costs. This alternative also benefits natural systems by expanding wildlife habitats along the Alafia River.

Disadvantages: The current cost of acquiring all of the flood prone properties is over three million dollars. Additionally, it is likely that most property owners in this area would not want to sell their property.

Effectiveness: This alternative does not relieve any flooding to the area but it does eliminate flood damage for home and property owners. Once all properties are county-owned, a 25-year flooding LOS B would be achieved by eliminating the roads and properties within the floodplain.

Estimated Cost: The estimated cost of this alternative would be $3,069,800.

Alternative 2:

Description: Alternative 2 is to build a dike that would basically encompass these neighborhoods and shield them from the rising Alafia River. This large embankment would start from just south of Lithia Pinecrest Road east of River Hills and extend to the Alafia River, enclosing all of the flooded streets, and then back to Lithia Pinecrest Road again south of River Hills. This dike would be well over a mile in length and more than ten feet high in some places. A pump station would be constructed within the diked enclosure to collect and discharge the local stormwater runoff from within to the river.

Advantages: This alternative would provide 25-year LOS flooding protection for all of the home and property owners.

Disadvantages: This alternative, while solving the flooding problem, would be costly and would be very difficult to permit, as the dike enclosure would create a hydraulic encroachment within the Alafia River floodplain.

Effectiveness: This embankment, if designed properly, would be effective in preventing these areas from flooding and provide the 25-year LOS flood protection.

Estimated Cost: The estimated costs of this alternative is $1,551,200.

Recommendation: Alternative 1 is the recommended alternative. This alternative is preferred because it is the only realistic solution. This alternative is costly, but a much more

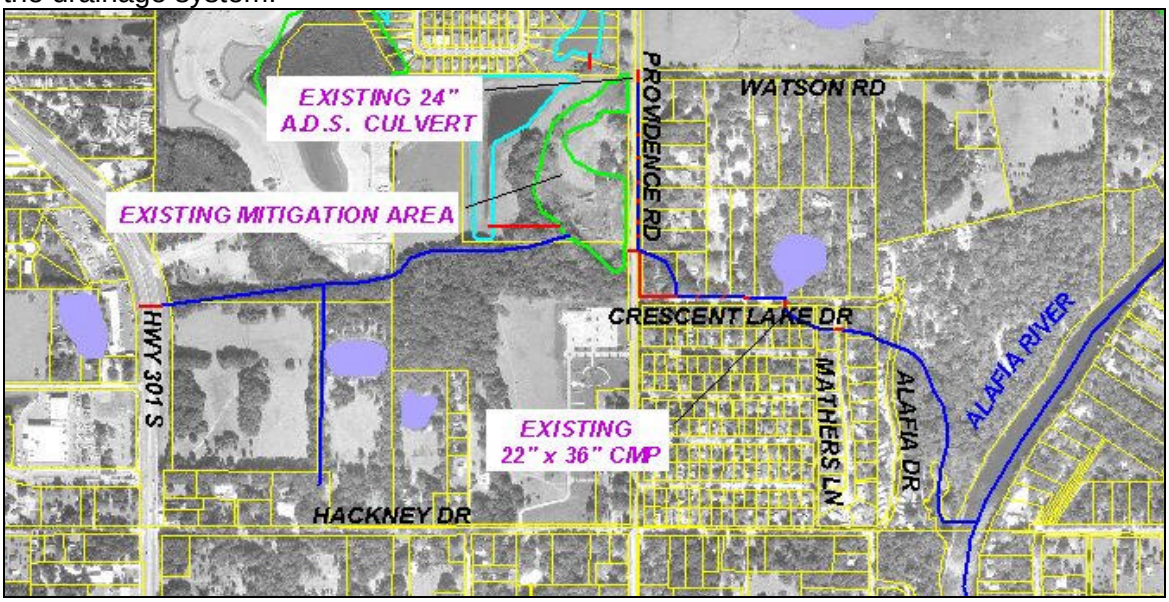
viable solution than Alternative 2. Alternative 1 also benefits natural systems by promoting a contiguous riparian corridor along the Alafia River.

Problem Area AR-4: Providence Road

Problem Definition:

In the Tributary N-11 drainage system, which drains Providence Road and Crescent Lake Drive, there are two flooding LOS deficiencies that were identified in the flooding conditions assessments. The modeling results indicate that 1.38 feet of water will inundate the intersection of Providence Road and Watson Road during the 25-year storm. This flooding problem is one of the most severe with respect to both flood depth and extent of inundation in the entire watershed, and was clearly evident during and after the Tropical Storm Gabrielle in September 2001. Not only was this intersection inundated by more than a foot of water, but severe road, property and house flooding occurred downstream of this intersection all the way to the Alafia River.

The entire drainage system from the Watson Road intersection to the river needs improvements to alleviate flooding. The existing 24" HDPE culvert under Watson Road that drains the area between Watson Road and Bloomingdale Drive is not only completely blocked, but also insufficiently sized to convey the peak discharge from the 25-year design storm event. Additionally, almost every driveway culvert in the Providence Road channel downstream of this intersection is crushed, buried or silted up. The problem is compounded by the extremely flat grade of the channel. A LOS deficiency was also identified at the cross drain under Crescent Lake Drive, which is part of the downstream drainage system. This 22"x36" CMPA, installed in the mid-1980's, is also undersized. Further downstream is the Alafia Drive cross drain where a corroded 36" CMP and a badly silted 27"x43" CMPA convey floodwaters to the Alafia River. Both structures are unmaintained, aged and insufficient. Additionally, the channel downstream of the Alafia Drive crossing is undersized and needs to be widened to convey the higher flows resulting from removing the upstream constrictions in the drainage system.



AR-4 Flooding Problem Area Location Map



Typical Providence Road driveway culvert



Providence Rd./Watson Rd intersection during Tropical Storm Gabrielle

Alternative Solutions:

Alternative 1:

Description: This alternative includes the replacement of all the undersized culverts within the Crescent Lake Drive/Providence Road conveyance system with 48" RCP culverts (or equivalent). This would reduce 25-year peak flood levels to below the crowns of these roads. These culvert replacements would include the four identified roadway cross drains and approximately ten driveway culverts. In addition, a segment of Watson Road, immediately east of the intersection with Providence Road, would be elevated to a crown elevation of 21.5 ft NGVD. The road currently dips down to elevation 20.0 ft NGVD within this section of Watson Road. The length of the segment is approximately 200 feet, and includes the portion of Watson Road containing one of the proposed culvert replacements.

Upsizing the culverts under Mathers Lane and Magnolia Drive (a.k.a. Alafia Drive) with 48" RCP's would reduce flood levels through the downstream mobile home park. Minor re-shaping of the roadside and outfall ditches would also be necessary to accommodate the larger culverts. Although this alternative would increase peak flow rates within the ditch, peak flood stages would be reduced throughout the tributary due to more efficient conveyance. Peak flow rates and flood stages within the Alafia River would not be adversely affected by this project because the river's peak stage occurs more than two days after the peak of Tributary N-11.

To accommodate the improvements, a 10'-15' wide drainage easement would be required from the properties fronting the east side of Providence Road and the north side of Crescent Lake Drive. In addition, acquisition of a 40' wide drainage easement along the length of the existing ditch between Crescent Lake Road and the Alafia River would be needed for construction and continued maintenance.

Advantages: This alternative does not require additional storage. This alternative should be permittable.

Disadvantages: Several drainage easements would have to be purchased in order to make the necessary improvements to the drainage system. Environmental permit requirements may include wetland mitigation.

Effectiveness: This alternative will achieve a 25-year flooding LOS A condition along Providence Road and Crescent Lake Drive. The project will also reduce peak flood elevations downstream through the mobile home park to the Alafia River.

Estimated Cost: This alternative would cost approximately $526,200.

Alternative 2:

Description: Alternative 2 would include raising Providence Road approximately 30", to an elevation of 23.0 ft NGVD, and increasing the flood storage within the existing wetland mitigation area west of Providence Road. The mitigation area currently accepts stormwater runoff from portions of Bloomingdale Hills Subdivision, Bloomingdale Avenue, and several subbasins along U.S. 301. The existing control structure for the mitigation area would be modified to increase the flood storage in the mitigation area. The existing control weir elevation would remain at 19.0 ft NGVD, and the weir opening would be reduced to lower the peak discharge rate and delay the time to peak.

Although this alternative would reduce peak flow rates and flood stages along Crescent Lake Drive, flood stages would increase near the intersection of Providence Road and Watson Road. This increase is due to raising Providence Road and peak stages in the mitigation area, effectively severing the floodplain on the east side of the Providence Road/Watson Road intersection from the mitigation area on the west side. The mitigation area currently provides flood relief for the intersection.

Advantages: This alternative does not require the purchase of drainage easements and does not require replacing any culvert replacements.

Disadvantages: This alternative increases peak flood stages at the intersection of Watson and Providence Road. Also, increasing flood storage in the existing mitigation area would require modifying the existing permit for the mitigation area.

Effectiveness: This alternative provides flood relief for Crescent Lake Drive and the mobile home park downstream, but because this alternative increases flood levels upstream and does not meet the prescribed 25-year LOS in all locations, it is not recommended. A flooding LOS D remains for Alternative 2.

Estimated Cost: The estimated costs of this alternative would be $677,800.

Alternative 3:

Description: This alternative is essentially a combination of Alternatives 1 and 2, with the exception that the culverts would be replaced with 42" RCP's instead of 48" RCP's. The increased attenuation provided by the mitigation area would reduce the required size of the culverts along Providence Road and Crescent Lake Drive. The project will

also reduce peak flood elevations downstream through the mobile home park to the Alafia River.

Advantages:
The advantage of this alternative is lower costs for culverts.

Disadvantages: The costs of raising Providence Road and modifying the mitigation area structure would exceed the savings resulting from installing smaller culverts (42" versus 48"). Therefore, the total costs of this alternative would exceed the costs of Alternative 1 and would come without any recognizable benefits.

Effectiveness: Alternative 3 will achieve flood LOS A for Providence Road and Crescent Lake Drive for the 25-year design storm.

Estimated Cost: This alternative would cost approximately $1,074,400.

Recommendation: Alternative 1 is the recommended alternative. It is the most cost-effective alternative that provides a 25-year LOS A flood protection for the entire drainage system.

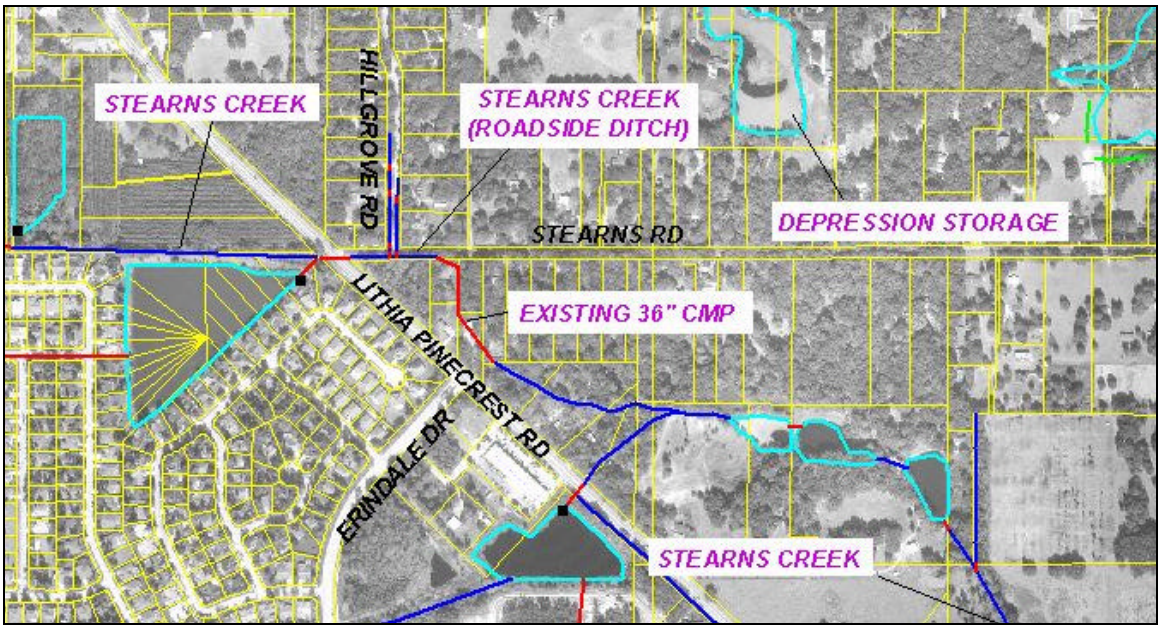
Problem Area AR-5: Stearns Road / Hillgrove Road

Problem Definition:

The Stearns Road / Hillgrove Road intersection just east of Lithia Pinecrest Road is identified by modeling analysis to not meet the 25-year LOS criteria. Road, yard and some structure flooding is indicated in this area. The flood elevation over Stearns Road is 46.17 ft NGVD and the Stearns Road crown is at 45.5 ft NGVD. Much of this flooding is floodwater that overtops Stearns Road from an undersized culvert located on the south side of the road, and then flows overland to a large depression north of Stearns Road. This culvert, approximately 400 feet long, is a 36" CMP connecting the Stearns Road roadside ditch and the Stearns Creek channel heading south. This 36" CMP conveys flow from three 3.5' x 11' box culverts a few hundred feet upstream at Lithia Pinecrest Road. There are numerous flood complaints in this area from various sources that verify this flooding problem. Significant road and yard flooding at the corner of Hillgrove Road and Stearns Road was reported by a local resident at the first Alafia River Watershed Management Plan Public Meeting. This intersection is directly across the street from the culvert inlet. Two flood complaints in the same location were reported to the County: one indicated that approximately nine blocks were under water and the other indicated flooding in the area of the pipe inlet. The County East Service Unit also reported flooding down the Stearns Road east of this culvert inlet.

In addition to the LOS deficiency there are several other drainage problems in this area. Stearns Road does not have a drainage system and water ponds on the side of the road and in yards. Also, a local resident reported severe property and house flooding on property north of Stearns Road after Tropical Storm Gabrielle. A large depression located north of Stearns Road receives all the drainage for this closed basin. This depression at one time was drained by a drainage well that maintained a water surface elevation of approximately 31.2 ft NGVD. In recent years, this drainage well was plugged by the SWFWMD. Since this storage area no longer has an outfall, the stage in the depression is maintained higher for a longer time following a storm. With this reduction in available flood storage, floodwater during a large

event will stage up and flood nearby homes and/or property. The drainage system on Hillgrove Road is also insufficient, as road and yard flooding is commonplace during large rainfall events. When Stearns Creek stages up, the water that would normally drain from Hillgrove Road into the Stearns Road ditch under Stearns Road, backs up on Hillgrove and sheets eastward to the closed depression north of Stearns Road.



AR-5 Flooding Problem Area Location Map



Flooding on Hillgrove Road



36" CMP culvert on Stearns Road

Alternative Solutions:

Alternative 1:

Description: Alternative 1 is a conceptual alternative the County stormwater department has developed. This alternative would aim to improve the local drainage system on Hillgrove Road, then route this drainage to the depression north of Stearns

Road via a newly constructed ditch that would also convey excess flows from the Stearns Road ditch to the depression. A pump station would be constructed at the depression to recover the storage capacity. This station would pump through a force main to the culvert inlet on Stearns Road.

Advantages: Alternative 1 makes use of existing depression storage. It also makes use of existing right-of-ways on Stearns Road and Hillgrove Road as well as giving the system an outfall. This alternative should be easily permittable.

Disadvantages: This alternative requires the purchase of several drainage easements. It also does not provide relief to the existing 36" CMP on Stearns Road.

Effectiveness: Alternative 1 does not significantly reduce flood elevations for the 25-year storm event over Stearns Road (46.17 ft NGVD to 46.11 ft NGVD) and would not provide 25-year flood protection for Hillgrove Road or surrounding properties. A 25-year flooding LOS C would remain for this area.

Estimated Cost: This alternative would cost approximately $315,400.

Alternative 2:

Description: Alternative 2 includes the improvement of the local drainage system on Hillgrove Road and replacement of the culverts from Hillgrove Road to the Stearns Road ditch. This will provide drainage relief for Hillgrove Road. Twelve hundred feet of 66" RCP would then be constructed along Stearns Road to connect the Stearns Road ditch to a newly constructed ditch east of the 36" CMP culvert inlet. This new system would then be the primary means of conveyance to Stearns Creek, and the existing 36" CMP would convey the excess flows. Inlets could be installed along the 66" RCP to relieve local drainage problems on Stearns Road. The newly constructed ditch would then carry flows south to a newly constructed 20-acre detention pond with an outfall structure. This pond would attenuate the higher flows resulting from the added conveyance of the 66" RCP. Additionally, a pump station would be constructed at the depression north of Stearns Road that would keep the storage drawn down to allow maximum available storage for the basin.

Advantages: This alternative makes use of existing right-of-ways on Stearns Road and Hillgrove Road. This alternative also gives the depression an outfall. The new pond and outfall structure could be designed to benefit water quality and natural systems. This alternative should be easily permittable.

Disadvantages: This alternative requires the purchase of over 20 acres of property for the detention pond. It also requires the purchase of drainage easements for the new ditch south of Stearns Road.

Effectiveness: Alternative 2 reduces 25-year peak flood elevations over Stearns Road from 46.17 ft NGVD to 45.63 ft NGVD. This reduced stage is still 0.13' over the road top (45.5 ft NGVD). This alternative has negligible impacts downstream and achieves a 25-year flooding LOS B for the area.

Estimated Cost: This alternative would cost approximately $2,532,800.

Alternative 3:

Description: Alternative 3 has all of the components from Alternative 2 plus an additional stormwater detention facility. This detention pond would be 6 acres in size and constructed northwest of the Stearns Road/Lithia Pinecrest Road intersection. This pond would attenuate flows upstream of the Stearns Road ditch enough to downsize the new relief storm sewer on Stearns Road from 66" to 48" and to reduce flood elevations such that no flooding would occur over Stearns Road for the 25-year storm event. This pond would also attenuate flows sufficiently to reduce the size of the larger downstream detention pond from 20 acres to 16 acres.

Advantages: Alternative 3 makes use of existing right-of-ways on Stearns Road and Hillgrove Road. This alternative also gives the depression an outfall. The new pond and outfall structure could be designed to benefit water quality and natural systems. This alternative should be easily permitted.

Disadvantages: Alternative 3 requires the purchase of over 22 acres of property for the detention ponds to attenuate the flooding at Stearns Road and the higher flows downstream. It also requires the purchase of drainage easements for the new ditch south of Stearns Road.

Effectiveness: Alternative 3 reduces peak flood elevations over Stearns Road from 46.17 ft NGVD to 45.46 ft NGVD. This reduced stage eliminates road flooding completely at Stearns Road (road top elevation 45.5 ft NGVD). This alternative also has no adverse impacts downstream and achieves a 25-year flooding LOS A for the entire area.

Estimated Cost: The capital costs for this alternative would be approximately $2,968,700

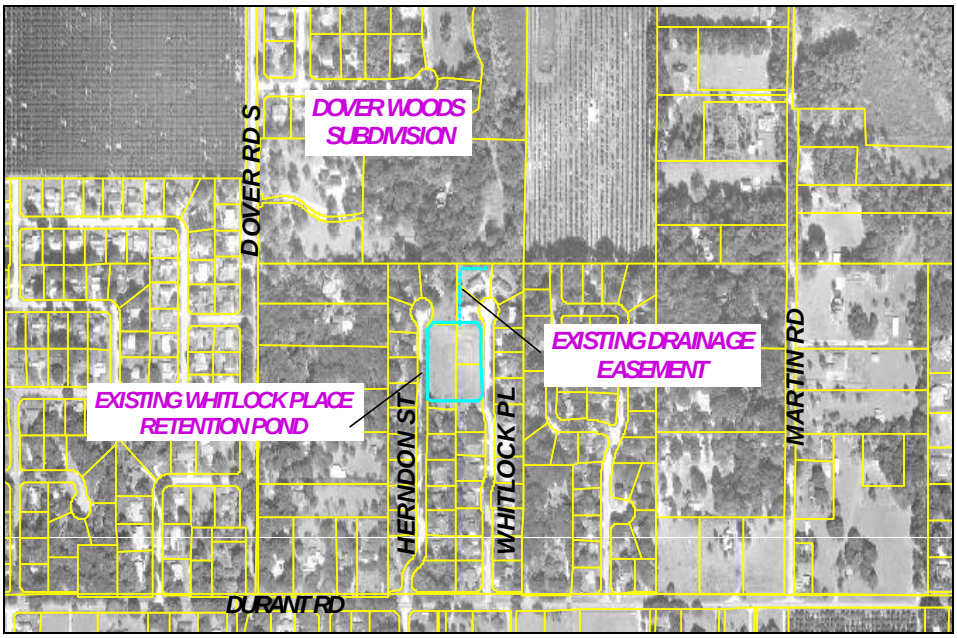
Recommendation: Because of its greater effectiveness in achieving the desired flooding LOS objectives, Alternative 3 is the recommended alternative for the Stearns Road area problem.

Problem Area AR-6: Whitlock Place Retention Pond

Problem Definition:

Severe street and house flooding is predicted for the north end of Whitlock Place and Herndon Street, both located off Durant Road. The hydrologic/hydraulic model indicates a flood elevation of 52.43 ft NGVD for the 25-year storm event at the subject pond. The elevations of the street and lowest finished floor are 48.0 ft NGVD and 51.0 ft NGVD respectively. This retention pond was constructed at the lowest point in a very large closed basin and has no outfall. There are four historical flood complaints from the El Nino events and one complaint from the East Service Unit in the immediate vicinity, and flooding at this location is a recurring problem. The service unit reported that the Whitlock Place retention pond is a poorly drained percolation pond. During Tropical Storm Gabrielle in September of

2001, emergency pumping measures were taken to alleviate flooding from the north end of Whitlock Place and Herndon Street. This pond is poorly designed and a permanent solution to this problem is needed. Hillsborough County is already considering construction of a permanent pump station at this location. Alternative 1 consists of a large pump station similar to that described by County engineers.



AR-6 Flooding Problem Area Location Map

Alternative Solutions:

Alternative 1:

Description: This alternative consists of the construction of a 10 cfs pump station at the pond location to pipe stormwater northward via a force main to Durant Road and then east along Durant Road to a creek that discharges into Stearns Lake and eventually into the Alafia River. The pump would keep the pond dry, provide an outfall, and provide immediate relief to the flood prone area.

Advantages: This alternative allows the County to utilize the right-of-way along Durant Road and limits easement purchases if any. This alternative also gives this large closed basin an outfall. Permitting this alternative should be fairly simple.

Disadvantages: This alternative will require a very large pump station and force main. The station would have to pump flows more than 4500 feet against a static head of over 20 feet. This alternative would also require continual operation and maintenance costs. There may be adverse impacts to Stearns Lake and downstream receiving waters created by the pump discharge.

Effectiveness: According to modeling results, this pump station would not prevent home or street flooding for the 25-year event. It would reduce the maximum flood

elevation from 52.43 ft NGVD to 52.17 ft NGVD for the 25-year event, and from 51.45 ft NGVD to ft 51.03 NGVD for the 10-year event. It would also provide immediate flood relief for the area. A 25-year flooding LOS D would remain for Alternative 1.

Estimated Cost: The estimated cost for this alternative is $527,300.

Alternative 2:

Description: In this alternative, the County would purchase part of the existing farmland property to the northeast of Whitlock Place and construct a 9-acre retention pond to provide additional storage for this closed basin. The pond bottom would be at elevation 42.4 ft NGVD. Additionally, a 30" RCP would be installed between the existing Whitlock retention pond and the newly constructed pond to equalize water surface elevations in the two facilities.

Advantages: This project utilizes the existing drainage easement between the north side of the existing pond and the proposed pond. This alternative also would not require any operational costs as does Alternative 1. Alternative 2 would not raise downstream flood elevations. This project should be feasible and permittable.

Disadvantages: Alternative 2 is more costly than Alternative 1 and is dependent on the purchase of the property north of Whitlock Place.

Effectiveness: Alternative 2 does not achieve the desired LOS for the 25-year design storm. The street elevation is 48.0 ft NGVD and the 25-year peak flood elevation is 49.96 ft NGVD. This alternative does eliminate structure flooding on both Whitlock Place and Herndon Street (finished floor elevation is 51.0 ft NGVD). Additionally, this alternative achieves a 10-year flooding LOS A for the entire area (the 10-year peak elevation is 47.98 ft NGVD). A 25-year flood LOS D would remain for Alternative 2.

Estimated Cost: This alternative would cost approximately $814,000

Alternative 3:

Description: This alternative consists of all the improvements from Alternative 2 plus purchasing additional property, possibly to the west of Durant Road for additional storage. Approximately 70 more acre-feet of storage would be required to eliminate all flooding in this area for the 25-year storm event and achieve a flooding LOS A. A more current detailed modeling analysis of this subbasin would have to be conducted to determine the amount and location of additional required storage.

Advantages: This project would utilize the existing drainage easement between the north side of the existing pond and the proposed pond. This alternative would also not require any operational costs as Alternative 1 does with the pump station. Alternative 2 would not raise any downstream flood elevations. This project should be feasible and permittable.

Disadvantages: This alternative has the same disadvantages as Alternative 2. It also has the disadvantage of even higher costs than Alternative 2.

Effectiveness: Provided enough available storage is created, this alternative could meet the 25-year LOS criteria for roads and structures in Hillsborough County. A 25-year LOS A could be achieved with Alternative 3.

Estimated Cost: This alternative would cost approximately $1,711,200

Recommendation: Alternative 2 is the recommended alternative. Although Alternative 2 does not achieve the 25-year flood LOS protection for county roads, it does achieve the 10-year LOS A, and eliminates structure flooding for the area. Also, the two roads that would become inundated are dead-end roads and no traffic would be hindered by these flooded streets except for local traffic associated with the residents that live at the end of Whitlock Place and Herndon Street.

Problem Area AR-7: Dee Circle & Alafia Ridge Road

Problem Definition:

Road and yard flooding along Alafia Ridge Loop was reported at the first Alafia River Watershed Management Plan Public Meeting. The flooding on Alafia Ridge Road is primarily due to the north pond of Dee Circle. This pond outfall discharges directly to Alafia Ridge Road through an undersized outfall pipe where the only means for conveyance is by sheet flow down Alafia Ridge Road. Street and yard flooding on Dee Circle was also reported by the Hillsborough County South Service Unit and in the Hillsborough County historical flood complaints. This flooding originates from the south stormwater pond on Dee Circle. The pond is undersized and floods over the bank onto Dee Circle and into residential yards during heavy rainfall events. Both Alafia Ridge Road and Dee Circle are located off McMullen Loop east of McMullen Road. It should be noted that these ponds are in a tertiary drainage system and were not included in the existing conditions hydrologic/hydraulic model analyses.

Alternative Solutions:

The County is aware of these problems and has contracted Reynolds, Smith and Hills Inc. (RS&H) to do an alternative analysis (CIP # 47075 and 40021). The following alternative solutions have been modeled and proposed by RS&H. Two combinations of improvement scenarios from six alternatives have been explored. Model schematics are provided in the RS&H detailed report.



AR-7 Flooding Problem Area Location Map



Outfall pipe from the north pond (ditch) Dee Circle



Undersized pond (south) on Dee Circle

Alternative 1:

Description: Alternative 1 is to regrade the north pond (ditch) and improve the outfall from the ditch to Alafia Ridge Road. The ditch currently exceeds the easement by almost 10 feet in some locations. Improving the outfall will provide relief to the northern end of Dee Circle and, when combined with Alternative 2, would provide a positive outfall to the south pond and relieve flooding for the entire area. Other improvements are necessary to make this solution viable. These alternatives will be discussed later.

Advantages: This alternative along with other improvements relieves flooding for the entire area.

Disadvantages: Regrading the north pond (ditch) and remaining with the existing cross-section will require the acquisition of a 30-foot easement. This is 12 feet more than the existing 18-foot easement.

Alternative 2:

Description: Alternative 2 is to expand the south pond by acquiring the vacant lot north of the existing pond. A connection to the new outfall provided by Alternative 1 would be necessary for the proper function of the system. Note that Alternative 2 also incorporates the improvements from Alternative 1.

Advantages: This alternative will provide additional stormwater storage for the south portion of Dee Circle and reduce localized street flooding.

Disadvantages: This alternative requires acquisition of property adjacent to the south pond on Dee Circle for pond expansion.

Alternative 3:

Description: Alternative 3 consists of installing an equalization pipe to connect the south pond and the north pond (ditch). The pipe into the north pond and the outfall pipe from it would also be upsized to a 36" RCP. Note that Alternative 3 incorporates the improvements from Alternatives 1 and 2.

Advantages: This alternative has the benefit of providing a positive outfall for the south pond system, thus providing flood relief there during the 25-year storm event.

Disadvantages: This alternative carries the disadvantages from Alternatives 1 and 2.

Alternative 4:

Description: Alternative 4 consists of installing a stormwater lift station at the south pond that will serve to drain the pond in large storm events. RS&H used the flows that overtop the banks of the pond in the existing conditions model for the 25-year storm event to size the pump and station. Alternative 4 also incorporates the improvements from Alternatives 1 and 2.

Advantages: This alternative has the benefit of more efficiently draining the south pond.

Disadvantages: This alternative has the disadvantage of higher cost when compared to Alternative 3.

Alternative 5:

Description: Alternative 5 involves the routing of stormwater flows from the improved outfall of the north pond (Alternative 1) and increased capacity of the south pond (Alternative 2). Alternative 5 consists of conveying stormwater flows along Alafia Ridge Road via an open drainage system.

Advantages: This alternative has the benefit of easier permitting than Alternative 6.

Disadvantages: This alternative has the disadvantage of possibly requiring some land acquisition. When proposed ditches are contained inside the existing right-of-way, there is some minimal downstream flooding along Alafia Ridge Road. However, when 15 feet of right-of-way is added along Alafia Ridge Road to accommodate an improved ditch cross-section, this flooding is alleviated.

Alternative 6:

Description: Alternative 6 consists of conveying stormwater flows along Alafia Ridge Road via a closed drainage system.

Advantages: This alternative has the benefit of not requiring any land acquisition.

Disadvantages: This alternative has the disadvantage of possible permitting difficulties and higher costs than Alternative 5.

Recommendation: The recommended solution for this problem is Alternative 3 combined with Alternative 5. This recommendation is for the County to regrade the north pond, install the equalization pipe between the north and south ponds, and convey flows down Alafia Ridge Road with an open drainage system. The installation of a stormwater lift station, while more efficient than the equalization pipe in draining the south pond, carries a potentially excessive cost. The cost issue also affects the closed drainage system for the Alafia Ridge Road, since it would involve the installation of almost 3000 feet of stormwater pipe of sizes larger than 36" RCP. It is assumed that the recommended alternative by RS&H would achieve at least a 25-year flooding LOS B.

Estimated Cost: The estimated cost for the recommended alternative is $201,400.

Problem Area AR-8: Revels Road

Problem Definition:

Street and property flooding at Revels Road was reported at the first Alafia River Watershed Management Plan Public Meeting. During significant rainfall events, stormwater runoff flows across Revels Road from the south and then to the west at the turn in Revels Road. This drainage problem was witnessed during Tropical Storm Gabrielle in September 2001. During a Parsons field investigation, a deficient and unmaintained secondary drainage system was discovered. This tertiary drainage system was not included in the hydrologic/hydraulic modeling analysis, but drainage improvements throughout this system are needed to resolve this problem.



AR-8 Flooding Problem Area Location Map



Revels Road looking west during Tropical Storm Gabrielle



Driveway culvert on Revels Road

Alternative Solutions:

Alternative 1:

Description: Alternative 1 consists of general improvements to the entire drainage system. The drainage system should be extended 300 feet east on the south side of the road to collect road runoff and stormwater runoff from the south. This would require installing one driveway culvert. Additionally, two existing driveway culverts are in need of replacement. Also, the entire ditch system on Revels Road needs maintenance improvements.

Advantages: Nearly all recommended improvements lie within the existing right-of –way. This project is also highly permittable.

Disadvantages: Drainage easements must be acquired to complete all recommended improvements.

Effectiveness: If engineered properly, this alternative would relieve all street flooding and provide flood LOS protection for Revels Road. It is assumed that this alternative would achieve at least a 25-year flooding LOS B.

Estimated Cost: The approximate cost for this alternative is $33,100.

Alternative 2:

Description: Alternative 2 incorporates all improvements from Alternative 1 but would involve only maintenance of the existing driveway culverts by clearing them out rather than replacing them.

Advantages: This alternative carries the same benefits as Alternative 1 and has the benefit of a slightly lower cost.

Disadvantages: Drainage easements must be acquired to complete all recommended improvements. Also, simply clearing the culverts may not solve the problem, and replacement may ultimately be necessary to achieve the target flooding LOS.

Effectiveness: If engineered properly, this alternative should relieve all street flooding and provide a 25-year flood LOS B protection for Revels Road.

Estimated Cost: The approximate cost of this alternative is $21,800.

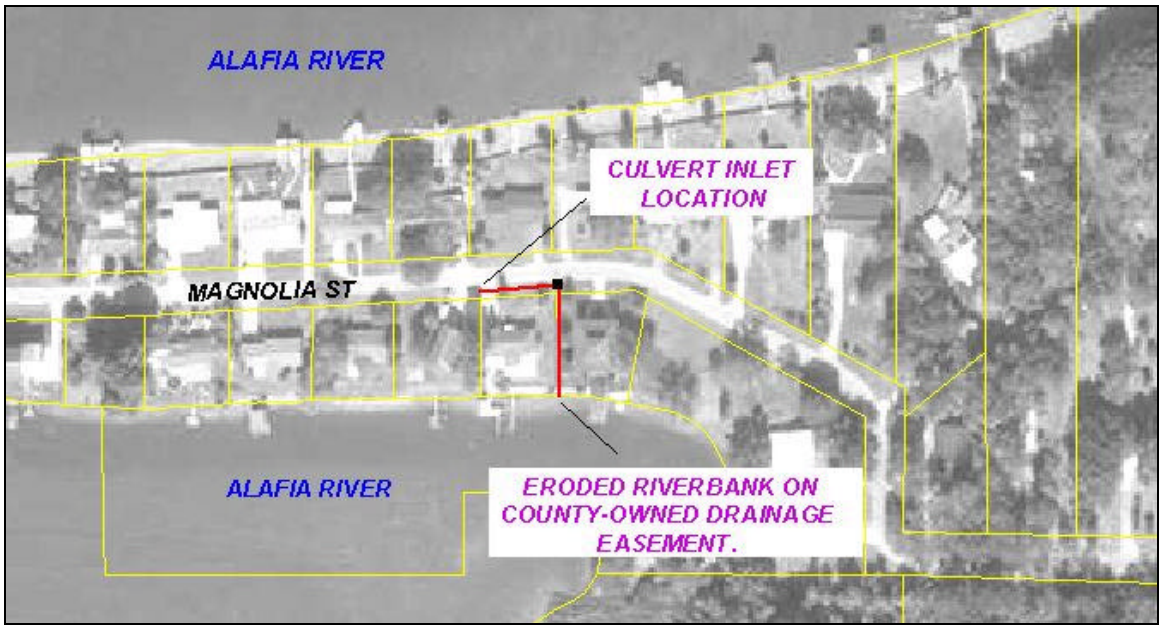
Recommendation: Alternative 1 is the recommended alternative. Although Alternative 1 has a slightly higher cost, the existing driveway culverts are old and in need of replacement. Also, replacement may still ultimately be necessary to provide proper conveyance of the secondary drainage system. It is anticipated that the recommended alternative will achieve at least a 25-year flooding LOS B.

Problem Area AR-9: Magnolia Street

Problem Definition:

A complaint from the first Alafia River Watershed Management Plan Public Meeting indicated road flooding on Magnolia Street, a small peninsula directly on the Alafia River. Magnolia Street is located off Riverview Drive just west of the I-75 interchange. After heavy rainfall events, a low spot in the road floods with up to six inches of water. After meeting with the complainant, it was determined that the runoff is unable to reach the culvert inlet at the flooded area. The shoulder in the right-of-way is much higher than the road or the culvert inlet, thus impeding the drainage path. Additionally, a county-owned drainage easement one parcel east is eroding away where a stormwater pipe discharges into the Alafia River. The

property owner adjacent to the easement indicated several feet of bank has eroded over the past few years.



AR-9 Flooding Problem Area Location Map

Alternative Solutions:

Alternative 1:

Description: Alternative 1 consists of regarding of the drainage path from the road to the culvert inlet in the right-of-way on the south side of the road in front of 8611 Magnolia Street. This would allow the runoff to flow into the culvert inlet before ponding in the street. This alternative would require very little excavation.

Advantages: This alternative would require very little cost to the county. The project is located in an existing right-of-way.

Disadvantages: There are no disadvantages to this alternative.

Effectiveness: This alternative would allow the water to reach the culvert inlet and relieve the road flooding. It is expected that this alternative would achieve at least a 25-year flooding LOS B for Magnolia Street.

Estimated Cost: This alternative would cost approximately $606.

Alternative 2:

Description: The County should repair/replace the eroded riverbank within the County easement in conjunction with installing a headwall to prevent future bank erosion.

Advantages: Repairing the eroded bank will help keep the existing stormwater pipe from being exposed and protect it from damage. This alternative will prevent future bank erosion.

Disadvantages: Besides protecting the pipe, repairing the bank has no other functional benefit.

Estimated Cost: This alternative would cost approximately $10,200.

Alternative 3:

Description: Alternative 3 is the combination of Alternatives 1 and 2.

Advantages: This alternative carries the benefits of Alternative 1 and 2.

Disadvantages: This alternative has the disadvantages of Alternatives 1 and 2

Estimated Cost: This alternative would cost approximately $10,800.

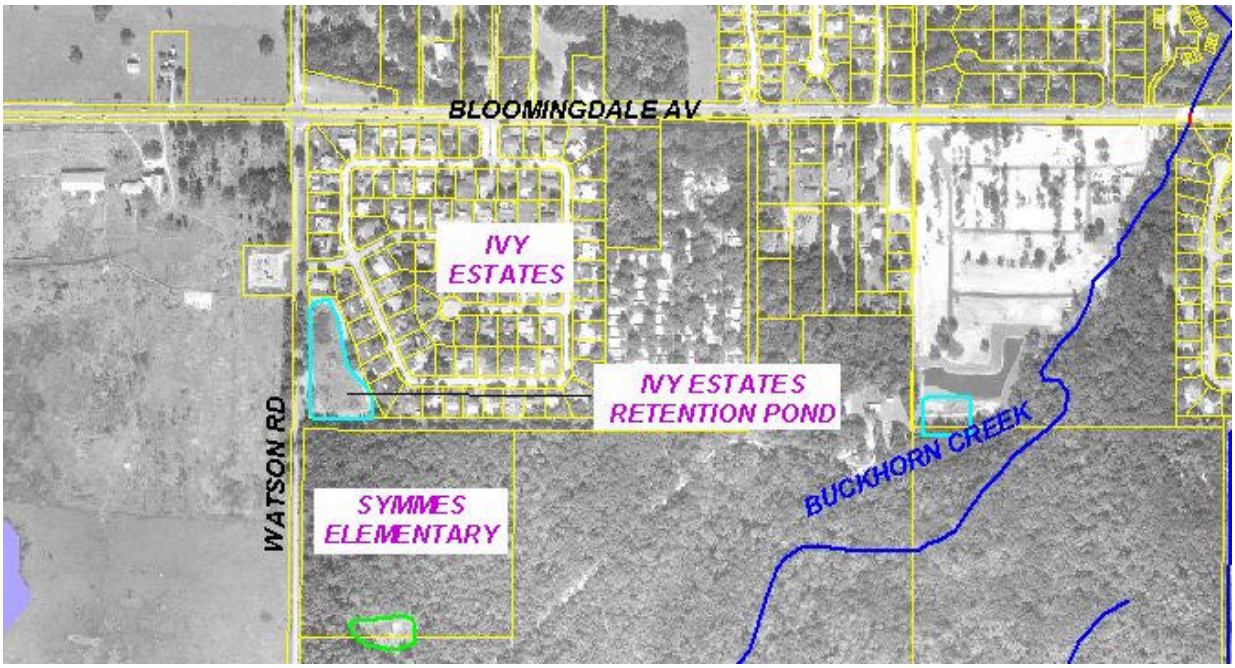
Recommendation: Alternative 3 is the recommended alternative. All components of this alternative lie within County right-of-way and this alternative has a low cost. It is expected that this alternative would achieve at least a 25-year flooding LOS B for Magnolia Street.

Problem Area AR-10: Watson Road/Ivy Estates

Problem Definition:

A section of Watson Road, south of the entrance to Ivy Estates Subdivision is prone to severe flooding. This section of Watson Road was constructed through a natural depressional area that has no surficial drainage outfall. A stormwater retention pond for the Ivy Estates subdivision was constructed east of Watson Road as part of the natural depressional area. A small part of the depressional area remains isolated on the west side of Watson Road. During significant rainfall events, the stormwater retention pond fills up and overtops its banks, flooding Watson Road. The retention pond has no outfall and typically remains flooded for extended periods of time. The flooding hinders access to the newly constructed Symmes Elementary School, which is located south of the Ivy Estates Subdivision on Watson Road.

This flooding problem was the subject of a study conducted by Environmental Research and Design, Inc. (ERD), for Hillsborough County (CIP # 47299). The results of this study were summarized in the report “Watson Road Drainage Improvement Project Evaluation Phase Results”, May 2001. The report considered several project alternatives including; (1) construction of an additional stormwater retention pond, and (2) providing a gravity outfall for the existing retention pond. The recommended alternative from this study consists of elevating the crown of Watson Road to elevation 30.7’ NGVD and regrading the existing stormwater retention pond in order to accommodate the higher Watson Road elevations and to provide additional storage.



AR-10 Flooding Problem Area Location Map



Watson Road just south of Bloomingdale Ave. after Tropical Storm Gabrielle

Alternative Solutions:

Alternative 1:

Description: The recommendation described in the ERD report was analyzed within the context of the Alafia River model. The recommendation consists of elevating the crown of Watson Road from elevation 30.1 ft NGVD to elevation 30.7 ft NGVD and regrading the existing Ivy Estates stormwater retention pond in order to accommodate the higher Watson Road elevations and to provide additional storage. However, the existing conditions 25-year and 100-year peak flood elevations in the Alafia River WMP model are computed to be 31.53 ft NGVD and 33.24 ft NGVD, respectively, which are significantly higher than the 25-year peak stage of 30.15 ft NGVD reported in the ERD study. The most likely explanation for this difference is the different runoff curve numbers used in each analysis. A CN of 63 was used for the applicable subbasin in the Alafia River model. By comparison, the ERD model employed a non-DCIA CN of 46.9 with 17% DCIA, which would be equivalent to an overall weighted CN of 56. Because this is a closed basin, it is volume sensitive, and therefore the difference in computed runoff volumes translates into a relatively large difference in flood stages.

A comparison of the Alafia River WMP model 25-year flood elevation of 31.53 ft NGVD to the proposed roadway crown elevation of 30.7 ft NGVD reveals that, for this alternative, the depth of flooding over the road would be approximately ten inches.

Advantages: In the context of the Alafia River WMP, this alternative has no advantages except the lowest cost.

Disadvantages: The primary disadvantage to this alternative is that it is not effective according to the Alafia River WMP model.

Effectiveness: In the context of the Alafia River WMP, this alternative does not achieve the 25-year target LOS desired by Hillsborough County. This alternative would only achieve a 25-year flooding LOS C.

Estimated Cost: This alternative would cost approximately $94,400.

Alternative 2:

Description: The flooding on Watson Road can be remedied by elevating the crown of the road by 30 inches, to an elevation of 32.5 ft NGVD. At this elevation, the roadway would remain dry during a 25-year storm event and would also be passable (with less than 9 inches of flooding over the crown) during a 100-year storm event. As in the plan recommended in the ERD report, an 18” equalizer pipe with inlets would be installed to connect the depressional area on the west side of Watson Road to the pond on the east side.

This alternative would require compensating storage for approximately 0.66 acre-feet of roadway fill placed within the 100-year floodplain. The pond regrading recommended in the ERD report would provide 0.40 acre-feet of compensating storage below elevation 30.0 ft NGVD. An additional 0.26 acre-feet of storage would

be required. This volume could possibly be created by excavating an area within the contiguous floodplain on the west side of Providence Road. This would require the purchase of a flood easement over a relatively small parcel of vacant land. For example, excavating an average of 2.6-foot depth over an area of one-tenth of an acre could provide the required storage.

Advantages: This alternative has the benefit of meeting all of the LOS criteria and potentially using the excavated material from the floodplain compensation for roadway elevation fill.

Disadvantages: This alternative requires floodplain compensation for the roadway fill by purchasing a flood easement and excavating 0.26 acre-feet. Also, Alternative 2 would not allow for storage volume recovery time. For example, if another large storm event were to take place a day or two before or after the 25-year event, there would not be sufficient storage available for the runoff and excess flooding would take place.

Effectiveness: This alternative eliminates any flooding over Watson Road for the 25-year storm event and keeps the road passable for the 100-year event. This alternative achieves a 25-year flooding LOS A for Watson Road.

Estimated Cost: This alternative would cost approximately $199,800.

Alternative 3:

Description: This alternative is similar to Alternative 2. However, the roadway would be elevated only to 32.0 ft NGVD instead of 32.5 ft NGVD. This would eliminate the need for additional floodplain compensation beyond the retention pond regrading plan recommended in the ERD report. This alternative would still achieve 25-year LOS on Watson Road. However, the roadway would not be passable for a 100-year event, with flood depths of approximately 15” over the crown.

Advantages: This alternative has the benefit of a lower cost to the County and easy permittability. This alternative does not require any floodplain compensation.

Disadvantages: For Alternative 3, Watson Road would not be passable for the 100-year event. This alternative would also not allow for the recovery time mentioned in Alternative 3 disadvantages.

Effectiveness: This alternative achieves the 25-year flood LOS A for Watson Road.

Estimated Cost: This alternative would cost approximately $134,600.

Alternative 4:

Description: This alternative includes all of the components of Alternative 2. In addition, an optional 500-gpm pump would be installed that would draw the pond down to normal levels within a few days after a storm event. The discharge would be to the lower reaches of Buckhorn Creek via 1,800 linear feet of 6” PVC pipe. Discharge to the Bloomingdale Road collection system was also considered as an alternative, but

this was ruled out because of the permitting concerns associated with discharging additional stormwater to an existing stormwater treatment facility.

The stormwater pump would allow faster recovery of storage volume within the Ivy Estates pond, thereby ensuring that the design storage volume would be available again within 3-5 days after a significant rainfall event.

Advantages: Because the road would remain passable for the 100-year storm, the elementary school could be utilized as a hurricane evacuation shelter if needed. The design discharge rate of 500 gpm, or about 1.1 cfs, would not significantly affect the peak flow rates and flood stages in Buckhorn Creek or the Alafia River.

Disadvantages: This alternative has the disadvantage of a higher cost to the County and possible permitting concerns associated with the pump station.

Effectiveness: This alternative meets the target 25-year flood protection for Watson Road. In addition to achieving the 25-year LOS protection, the roadway would also remain passable (with less than 9" of flooding over the crown) for the 100-year, 24-hour design storm. This alternative achieves a 25-year flooding LOS A for Watson Road.

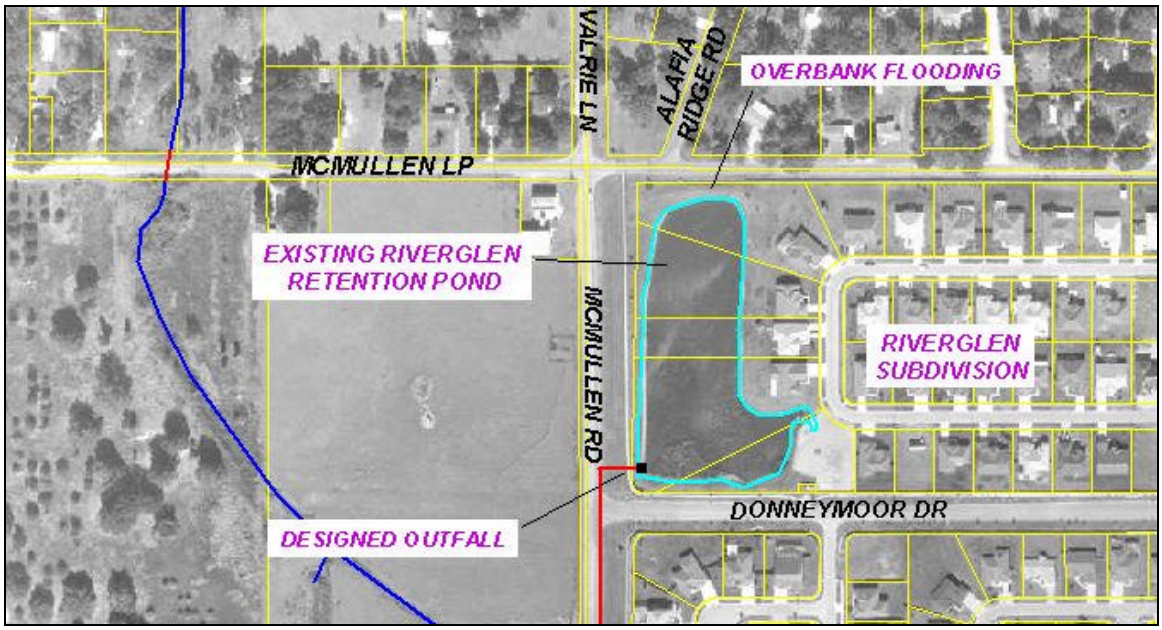
Estimated Cost: This alternative would cost approximately $349,600.

Recommendation: Alternative 4 is the recommended alternative. Although more costly than Alternatives 2 and 3, this alternative meets the desired LOS, and the pump station would help ensure the availability of the design flood storage volume when needed.

Problem Area AR-11: Riverglen Detention Pond

Problem Definition:

Improper function of the outfall for Riverglen detention pond on the corner of McMullen Road and McMullen Loop causes the pond to overtop the bank and flood across McMullen Loop. The water also causes flooding down Valrie Lane as well as exacerbating the flooding on Alafia Ridge Road, as witnessed during recent storm events. From visual inspection during field visits, the Riverglen pond top of bank appeared to be at a lower elevation than the top of the control structure. It is uncertain whether the pond bank is not at the correct elevation or if the control structure was poorly designed or constructed.



AR-11 Flooding Problem Area Location Map



The north bank of Riverglen detention pond during Tropical Storm Gabrielle

Alternative Solutions:

Alternative 1:

Description: Hillsborough County staff has referred this matter to County Enforcement to take action against the owner and Engineer of Record to correct what is perceived to be a design or construction problem of the pond outfall.

Advantages: This alternative has the benefit of no capital costs to the County.

Disadvantages: The only disadvantage to this alternative is that it may take a long time to actually get the owner and Engineer of Record to take the actions necessary to remedy this deficiency.

Effectiveness: If the outfall for this detention pond is reconstructed and/or designed correctly, it is assumed that the pond should meet the County's 25-year target LOS B.

Estimated Cost: There would be no cost to the County for this alternative.

Alternative 2:

Description: Alternative 2 is for the County to take initiative to rectify the problem on its own. The County would either have the problem analyzed and corrected internally, or hire an outside consultant to survey and conduct an independent analysis.

Advantages: The only advantage to this alternative is that the problem would be addressed and corrected sooner than if the County waited for the responsible parties to do so.

Disadvantages: This alternative has the disadvantage of having to use County funds.

Effectiveness: If the outfall for this detention pond is reconstructed and/or designed correctly it is assumed that the pond should meet the County's 25-year target LOS B.

Estimated Cost: There would be no cost associated with this alternative.

Recommendation: Alternative 1 is the recommended alternative. The County should be able to enjoin the owner and Engineer of Record to correct the problem. This would be at no capital cost to the County.

13.3 Water Quality Improvement Alternatives

Water quality improvement alternatives were evaluated for the Alafia River Watershed. These water quality improvement alternatives include structural best management practices (BMP's) in most of the subwatersheds as well as non-structural best management practices (BMP's) applicable basin-wide. The focus of this section is structural BMP's. Details concerning the watershed-wide BMP's are provided in Chapter 15.

13.3.1 Site Selection Methodology

Water quality impairments exist, watershed-wide, in the Alafia River Watershed. The majority of water quality problems that have been identified in the watershed are associated with nutrients and coliforms; in addition, low dissolved oxygen levels are problematic in some tributaries, and concerns exist in some tributaries due to metals concentrations in excess of state standards. Because water quality improvement is needed in all subwatersheds, suitable sites for water quality improvement projects were evaluated in each subwatershed.

Site selection was accomplished using a two-phase process – a *Site Screening Analysis* and a *Final Site Selection Analysis*. The first phase was accomplished using recent aerials, land use maps, 5-foot interval topographic maps, and maps showing the locations of publicly owned land. A list of approximately 50 sites was created and then reduced to 26 sites by comparing the suitability of the different sites, one with another, to provide water quality improvement.

The goal of the analysis was to identify sites suitable for water quality treatment. Considering the scale of this study, sites for BMP's capable of providing treatment for large areas were sought – in other words, sites for water quality treatment ponds and marshes. Sedimentation boxes and other physical treatment technologies are effective in providing treatment for smaller basins; however, sites capable of providing treatment for large quantities of runoff are the focus of this plan.

The site selection began by selecting relatively large, open (non-forested and non-developed) sites adjacent to the creeks and streams of the watershed; furthermore, sites were selected for evaluation based on their position in the watershed- that is water quality improvement sites should receive drainage from large areas of non-natural land uses.

The second phase, *Final Site Selection Analysis*, was accomplished using the two-foot interval topographic maps along with the flood control model and field investigations, as required. Over half of the 26 sites were not suitable for treatment areas due to grade differences between the creek and the potential treatment area site. Obviously, given enough construction effort, these grade differences could be overcome, but, instead, the focus was placed on the ten or so projects that "worked" with respect to existing grade. The use of blockages in the creek to "make" the creek drain to higher ground was avoided because these blockages would be contrary to the flood control and natural systems elements of the plan.

13.3.2 Potential Water Quality Improvement Projects

Proposed water quality improvement projects are contained within most subwatersheds with the exception of the North and South Prongs of the Alafia River (see Figure 13.3-1). Detailed descriptions of potential projects "dedicated" to water quality improvement are provided below along with reference to flood control projects with water quality treatment elements.

Water quality benefits are also provided by many of the flood control projects that seek to control or remove sources of erosion, and most of the natural systems projects will provide significant water quality improvement benefits - these projects are described elsewhere in Chapter 13.

FIGURE 13.3-1

ALAFIA RIVER WATERSHED WATER QUALITY ALTERNATIVE LOCATIONS MAP

LEGEND

- *AR-1/WQ* — *Water Quality Alternative Location*
- *Subwatershed Boundary*
- *Creek*
- *River*
- *Storage*
- *County Boundary*

N W E S

0 1 2 Miles

HILLSBOROUGH COUNTY
FLORIDA

M L KING BLVD
VALRICO RD N
DOVER RD
TURKEY CREEK RD
TRAPNELL RD
LUMSDEN RD
BLOOMINGDALE AVE
BELL SHOALS RD
BOYETTE RD
BALM RIVERVIEW RD
NICHOLS RD
LITHIA RD

TC-1/WQ
TC-2/WQ
TC-3/WQ
TC-4/WQ
ENG-1/WQ
ENG-2/WQ
AR-1/WQ
BELL-3/WQ
BELL-2/WQ
FISH-1/WQ

TURKEY CREEK
ENGLISH CREEK
BUCKHORN CREEK
ALAFIA RIVER MAIN STEM
BELL CREEK
FISHHAWK CREEK
NORTH PRONG ALAFIA RIVER
SOUTH PRONG ALAFIA RIVER

39 60 676 75 41 301

PARSONS ENGINEERING SCIENCE

Figure 13.3-1 (11 x 17 back)

13.3.2.1 Buckhorn Creek Subwatershed

High NO_x levels and frequent algal blooms have been reported in this, the most urban, Alafia River Watershed. All of the water quality improvement projects proposed for this subwatershed provide flood control benefits as well. These projects include:

- **Barkfield Street and Huntington Street Drainage Improvements (BUCK-1/BUCK-2)-** Replace Huntington Lake outfall structure with a control structure designed to fully optimize the stormwater detention and treatment capacity of this lake.
- **Craft Road Ditch Culvert Replacements and Stormwater Detention Facility (BUCK-3)** - A new 3.4-acre stormwater detention pond is proposed to provide stormwater treatment and attenuation
- **Bloomingdale West Pond Outfall Retrofits (BUCK-4)** - Replace outfall structures for the Canoga Park and the Bloomingdale West ponds with control structures that will provide enhanced flood control and stormwater treatment function over the existing structures.
- **Lithia Oaks Pond Outfall Retrofit (BUCK-5)** - Replace outfall structure for the Lithia Oaks pond with a control structure that will provide enhanced flood control and stormwater treatment functions over the existing structure.
- **Buckhorn Creek Stormwater Detention Pond and Wetland Restoration/Enhancement (BUCK-6)** - Construct a 12.0-acre on-line stormwater detention pond.

These projects are described in more detail in Section 13.2

13.3.2.2 Bell Creek Subwatershed

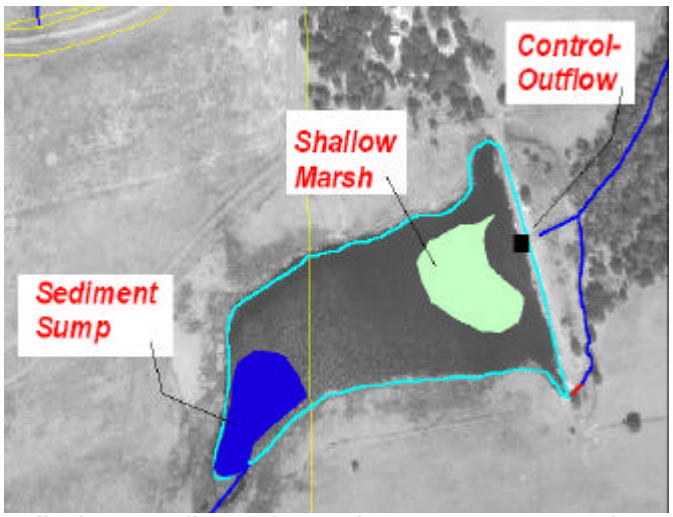
Bell Creek experiences water quality impairments with respect to dissolved oxygen, phosphorous, and NO_x; in addition, high fecal coliform levels have been observed in this Alafia River tributary. Three potential projects were identified in the Bell Creek Subwatershed - two existing impoundments could be converted to stormwater treatment areas (Bell1/WQ and Bell2/WQ), and an existing pollution source could be eliminated (Bell3/WQ). These three projects are described in the following subsections.

Bell 1/WQ: Bell Creek Pond Improvements – Site 1

A riser structure impounds water in this existing, on-line pond. With improvements, this existing impoundment provides a good opportunity to provide increased water quality treatment.

The primary improvement proposed for this existing pond involves replacing the riser structure with a new control structure. This new structure would be equipped with a bleed-down device to allow for detention time and recovery of a treatment volume. To further enhance water quality improvement benefits, a sump could be dredged at the inflow side of the pond. The dredged material could be placed near the outflow side of the pond to create a shallow littoral zone.

The pond was full, with the level slightly above the weir crest, in the photograph shown below taken in October 1999. The hydrologic conditions preceding this photograph consisted of a near normal summer with a somewhat drier-than–normal September and October (based on the rainfall recording station at Plant City Airport); therefore, seasonal high water in the vicinity is likely somewhat higher than the pond water surface. In the interest of water conservation, the bottom of the treatment volume should be set equal to the existing weir crest at elevation 48.7. Allowing for a 1.5-foot treatment depth would make the new overflow weir elevation 50.2.



Bell 1/WQ: Bell Creek Pond Improvements – Site 1

A one-foot high berm constructed along the access road (see photograph) will allow for approximately 0.5 feet of freeboard above the treatment volume.

This project will increase upstream flood stage somewhat if designed as described herein; however, these increases appear to be within an acceptable range. To avoid increases to flood stage altogether, the existing spill crest could be maintained and a bleed-down devise would be constructed 1.5 feet lower at elevation 47.2. This is not the preferred alternative due to potential impacts to surficial aquifer levels.

The project, as proposed herein, would increase the 25-year flood stage by about 1 foot at the pond. This increase is dampened to about 0.5 feet approximately 200 feet upstream (Node 731075) and completely dampened by 6,000 feet upstream (Node 731110). Flood stages downstream are lowered due to increased storage in the pond. Approximately 27 acre-feet of treatment volume can be accommodated by this project, which is expected to cost around $120, 000.

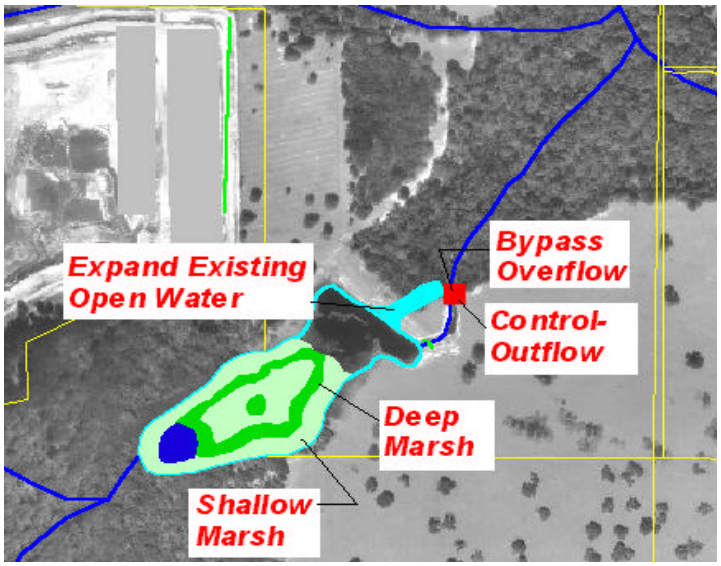


Existing pond outfall and access road

Bell 2/WQ Bell Creek Pond Improvements – Site 2

Like Bell1/WQ, an existing pond is present at this location; unlike Bell1/WQ the pond has no outfall structure - flow from the pond is controlled by the channel invert on the downstream side of the pond as shown in the graphic below.

Proposed improvements to this existing pond include expansion of the open water area and excavation within the existing depressional area for creation of shallow and deep marshes. A bypass control structure will allow high flows to bypass the treatment system thus mitigating potential impacts to flood stage. A bleed-down structure at the northeast side of the pond will allow for detention time and recovery of a treatment volume. The bypass overflow weir would be constructed at around elevation 85.5, which is approximately 1.5 feet above the existing water surface elevation.



Bell 2/WQ Bell Creek Pond Improvements Site 2

This alternate seeks to minimize earthwork. A site topographic survey is not available, but it appears that much of the existing depressional area would not be inundated by the proposed increase in water level and the existing deeper areas may be too deep for planting (note the steep escarpment in the photograph below). For these reasons, it may be beneficial to create a "mid-level plateau" to plant wetland vegetation.



Outfall channel



Existing depression with escarpment

This project would cause very minimal increases to flood stage – even more minimal if constructed in conjunction with Bell 1/WQ. At a cost of around $200,000, this project would

provide about ten (10) acre-feet of treatment. This site is located on an approved ELAPP site; therefore, land costs are not included in the cost estimate.

Bell 3/WQ -Shadow Run Inlet Plugging

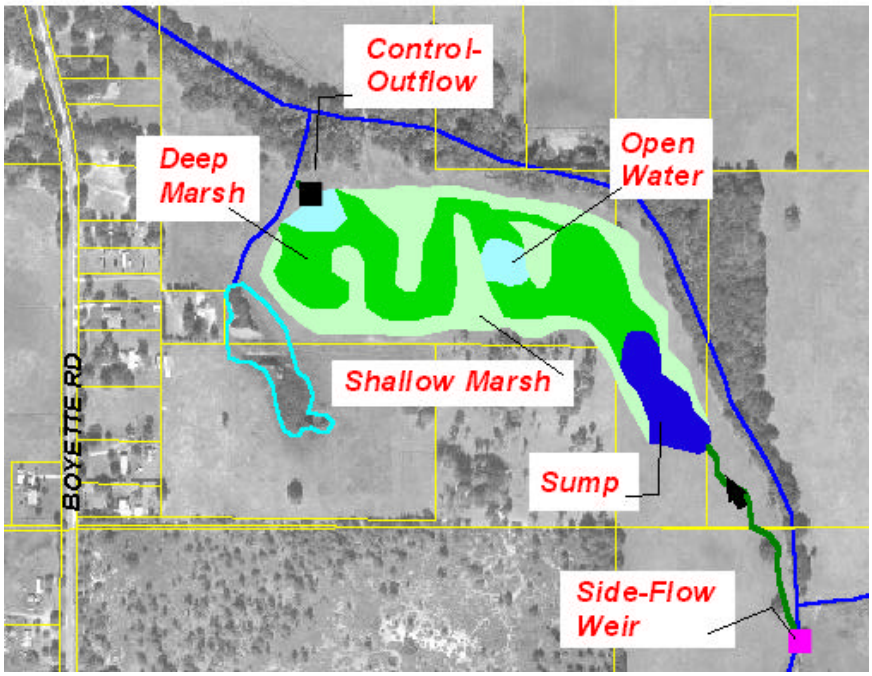
An abandoned roadway and associated drainage system exists on this Hillsborough County ELAPP site. These site improvements were constructed for a planned expansion of the Shadow Run Subdivision. The drainage inlets, along Donneymoor Drive, are traps for organic material (leaves, etc.) that subsequently decays and contributes to pollutant loads in Bell Creek. These inlets can be filled with sand or flowable fill. No impacts are expected to creek flow, but drainage from Donneymoor Drive will be inhibited – an acceptable condition according to the Hillsborough County ELAPP employee who suggested this project.

13.3.2.3 Fishhawk Creek

Total nitrogen, NOx, and phosphorous levels are high in Fishhawk Creek as are total and fecal coliforms counts. Deeply incised channels, forested riparian areas, and rolling terrain reduce the prevalence of sites suitable for water quality treatment areas.

FISH-1/WQ: Fishhawk Creek Surface Water Treatment Area

Proposed improvements to this site include the installation of a side-flow weir to divert water from Little Fishhawk Creek into a treatment area consisting of a sump, open water, and marshes. A bleed-down structure at the west side of the pond will allow for detention time and recovery of a treatment volume.



FISH-1/WQ: Fishhawk Creek Surface Water Treatment Area

Around 30 acre-feet of water quality treatment volume can be handled by this facility at an expected cost of about $1.6 million. Water would be withdrawn from the Little Alafia approximately 850 feet upstream of the treatment facility. The purpose of siting the withdrawal point upstream of the site is to overcome difficulties associated with grade differences between the site and the creek. The project site at this

location is noticeably higher than the adjacent creek bed. The upstream withdrawal point takes advantage of the higher upstream elevation and avoids the need for constructing a weir in the creek to build up the required head. An unnatural obstruction in the creek is undesirable from both a flood control and natural systems standpoint.

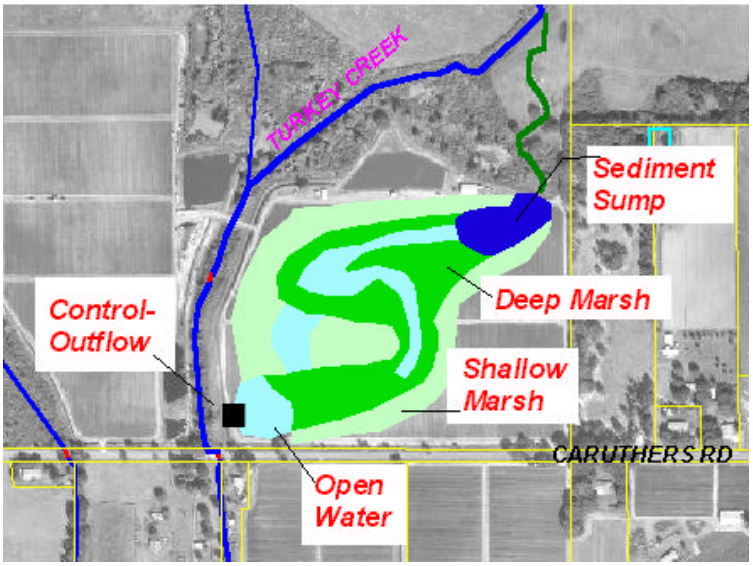
13.3.2.4 Turkey Creek

Nutrient levels and the presence of fecal material are the primary water quality issues associated with the Turkey Creek Watershed. Nutrient levels, especially phosphorous and NO_x are high in Turkey Creek; in addition, total coliform as well as fecal coliform counts are consistently high. The availability of water quality data for the Little Alafia River above Medard Reservoir is very limited, and data suggests that Medard Reservoir provides a great deal of water quality improvement benefits; however, protection of water quality in the natural segments of the Little Alafia River between Holloway Road and Medard Reservoir is needed. Four water quality projects were identified in the Turkey Creek Watershed.

TC-1/WQ: Turkey Creek Surface Water Treatment Area- Site 1

This improvement project consists of a diversion channel to transfer water from Turkey Creek to a treatment marsh. The diversion channel is needed so that water may be withdrawn at an upstream location with grade more compatible to the treatment area site. A bleed-down structure at the southwest corner of the pond will allow for detention time and recovery of a treatment volume

A treatment volume of approximately 28 acre-feet can be accommodated at this site at a cost of $1.7 million. The withdrawal point is about 700 feet upstream of the site.



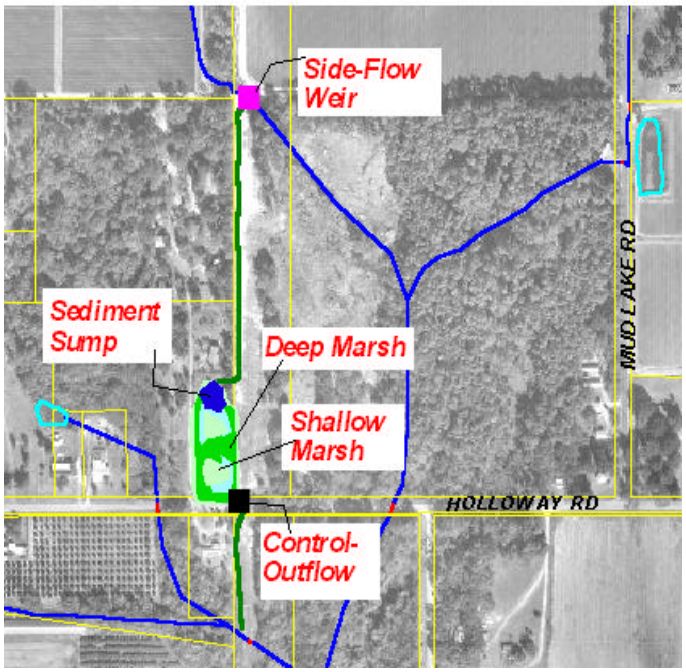
TC-1/WQ: Turkey Creek Surface Water Treatment Area- Site 1

TC-2/WQ: Turkey Creek Surface Water Treatment Area- Site 2

This improvement project consists of a diversion channel to transfer water from the Little Alafia River to a treatment marsh. The diversion channel is needed so that water may be withdrawn at an upstream location with grade more compatible to the treatment area site. The withdrawal location (see location of side-flow weir in graphic at right) was selected in order to take advantage of an existing electric transmission line corridor.

A bleed-down structure at the southeast corner of the pond will allow for detention time and recovery of a treatment volume.

Approximately two acre-feet of treatment can be provided at this location at a cost of around $150,000. Land acquisition costs within the power easement are not included; rather, it is assumed that an agreement for use of the corridor can be arranged with Tampa Electric.



TC-2/WQ: Turkey Creek Surface Water Treatment Area- Site 2

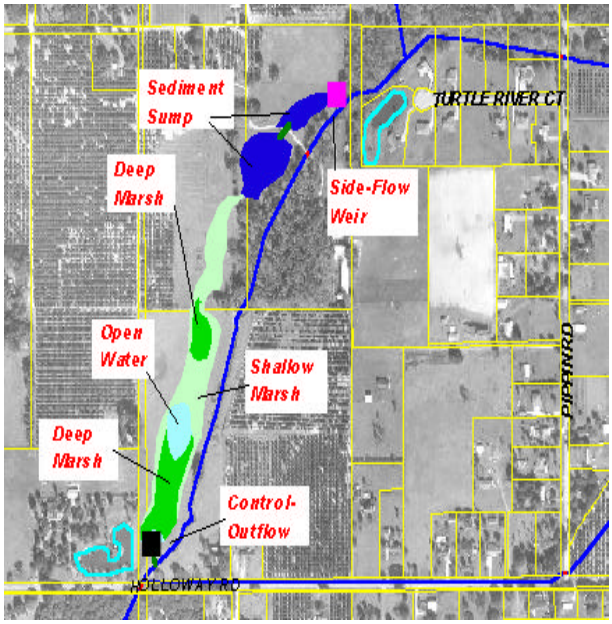


Withdrawal point at transmission line access road crossing.

TC-3/WQ: Turkey Creek Surface Water Treatment Area- Site 3

This low-lying, open area adjacent to a tributary of the Little Alafia River provides an excellent location to provide surface water treatment. Proposed improvements to this site include the installation of a side-flow weir to divert water from the creek into a treatment area consisting of a sump, open water, and marshes. A bleed-down structure at the southern (downstream) end of the pond will allow for detention time and recovery of a treatment volume.

A treatment volume of about four acre-feet can be accommodated at this site. With land acquisition this project is expected to cost around a million dollars.



TC-3/WQ: Turkey Creek Surface Water Treatment Area- Site 3



Proposed project site.

TC-4/WQ: Cropland Soil Retention Demonstration Project

Improper crop management practices contribute to water quality impairments throughout the Alafia River Watershed. These impairments result from sediment laden runoff originating from cropland. Farms that predate permitting requirements appear to contain few runoff controls and erosion control measures.

This existing strawberry field provides an excellent opportunity to demonstrate the effectiveness, in regards to soil retention, of proper crop management practices. Discharge from this field is free of offsite flow



TC-4/WQ: Cropland Soil Retention Demonstration Project

influences, and onsite observations indicate that the farm operator has attempted to implement measures aimed at soil retention (see photograph below).

The County could work with the farm's owner to implement the measures discussed herein; subsequently, the results of this project could be used to help "make the case" for improved agricultural management practices throughout the watershed. This proposed demonstration projects consists of three basic parts:

Proper Row Orientation – Currently this field's rows are oriented with the direction of overland flow. This orientation increases runoff velocities across the field and encourages erosion. Convincing the farm owner to orient the rows in the opposite direction, perpendicular to the flow direction, could be the "highest hurdle" that will be encountered in gaining permission to implement this project. Currently the rows are oriented in a direction that maximizes row length; thus, there are fewer rows, and the rows can be plowed and maintained more quickly due to fewer "turn-arounds". Hopefully, the prospect of minimizing future soil loss will be sufficient incentive.



Existing strawberry field

Fallow Period Planting – Rye or other grass will be planted when the field is fallow to reduce erosion.

Sedimentation Area – A sedimentation area will be constructed and maintained. This sedimentation area would consist of two, parallel "linear ponds"- a primary settling area and a vegetated filtering and discharge channel. The primary settling area would be constructed in the location of the existing ditch (refer to photograph, above) but would not contain a directly connected outfall; rather, water would drain from the primary settling area through a series of weirs placed along the length of a berm separating the two treatment areas. This method of discharge will reduce flow velocities and encourage settling. Most of the settling is expected to occur in the sedimentation area, which will be dredged out periodically. Further settling will take place within the vegetated discharge channel – which may also need to be dredged and replanted periodically, but with less frequency. Discharge to the roadside drainage system would occur from the vegetated filtering and discharge channel.

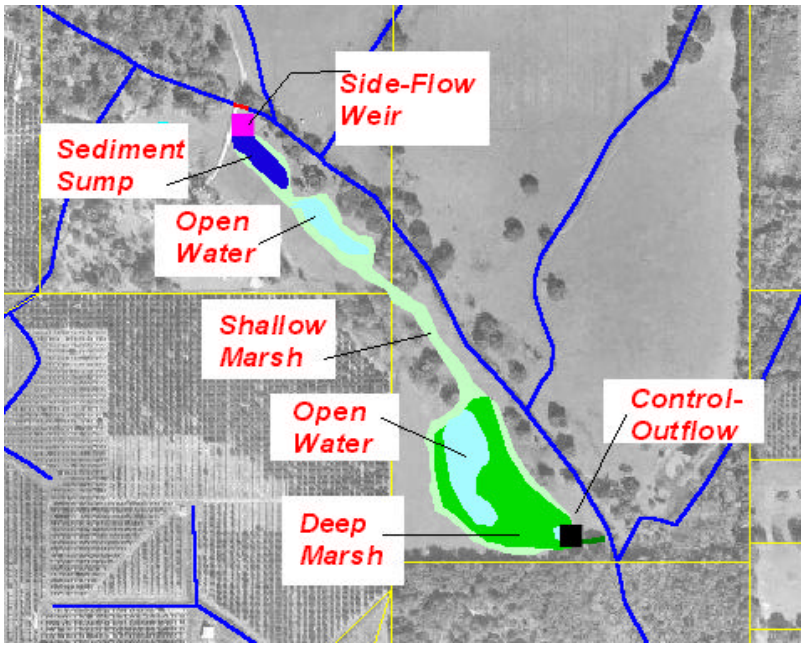
A monitoring component could be added to gauge the effectiveness of these measures, if desired. Monitoring would consist of measuring, by means of ground survey or number of earth hauler loads, the accumulated sediment before and after implementing these measures.

13.3.2.5. English Creek

English Creek is plagued by excessive coliform and nutrient concentrations. These high nutrient concentrations include both phosphorous and nitrogen – especially inorganic nitrogen. Two sites were selected for water quality improvement projects within the English Creek Watershed.

ENG-1/WQ: English Creek Surface Water Treatment Area – Site 1

Relatively low relief and absence of riparian forests makes this existing pasture an ideal location to provide increased water quality treatment.



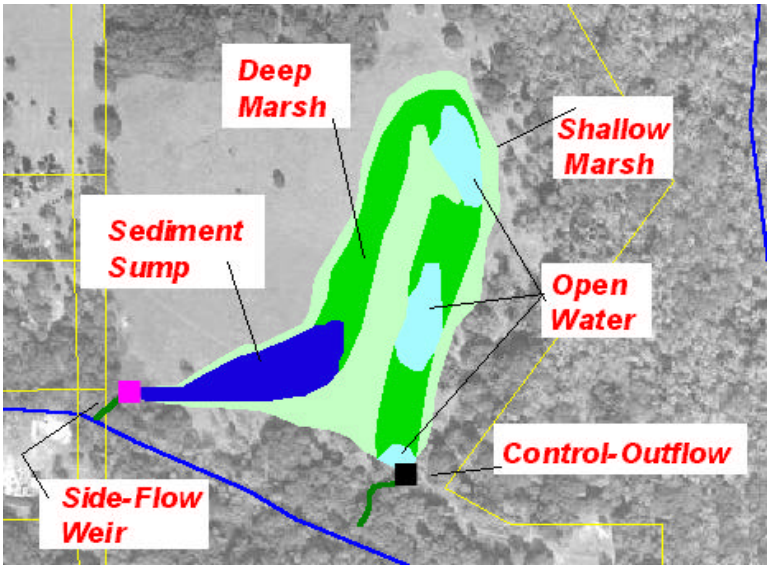
Proposed improvements to this site include the installation of a side-flow weir to divert water from Howell Branch into a treatment area consisting of a sump, open water, and marshes. A bleed-down structure at the east side of the pond will allow for detention time and recovery of a treatment volume.

Approximately 7.5-acre-feet of treatment can be provided by this off-line detention facility, which is expected to cost around $722,000. The side-flow weir design will allow storm flows into the pond without interfering with the hydraulic capacity of the creek or creating a tailwater that is higher than the existing condition. This inflow structure could also be equipped with low-flow orifice or v-notch weir to help keep the treatment marsh hydrated during dry periods. The need for this low-flow devise will depend on seasonal high water elevation and design grades, and may require backflow prevention to guard against “short-circuiting” of the treatment system.

ENG-2/WQ: English Creek Surface Water Treatment Area – Site 2

Relatively low relief and absence of riparian forests makes this existing pasture an ideal location to provide increased water quality treatment. This site’s Hillsborough County ownership further enhances the site’s value as a water quality improvement area.

Proposed improvements to this site include the installation of a side-flow weir to divert water from this English Creek tributary into a treatment area consisting of a sump, open water, and marshes. A bleed-down structure at the east side of the pond will allow for detention time and recovery of a treatment volume.



A water quality volume of approximately 12 acre-feet can be accommodated at this site, which is expected to cost around $675,000. The proposed inflow structure would be similar to the inflow structure described above for ENG-1/WQ with respect to the flood impact mitigation properties of the side-flow weir and the potential low-flow devise.

13.3.2.6 Alafia River Main Stem

The Alafia River Main Stem suffers water quality impairments with respect to dissolved oxygen (DO), nutrients, and coliforms. DO concentrations are adversely impacting water quality, with minimum mid-depth concentrations below 2 mg/l. Dissolved oxygen saturation was identified as a degrading condition in the Alafia River Main Stem. Nutrients, particularly nitrogen, are elevated with total phosphorous exceeding screening criteria. Several annual maximums for total and fecal coliform bacteria were substantially above water quality criteria.

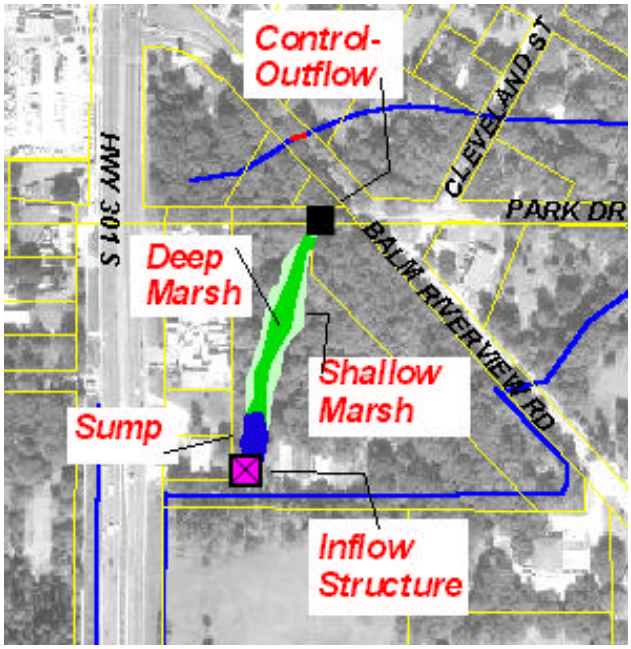
Several of the Alafia River Main Stem Watershed flood control projects will also provide water quality improvement benefits, including one relatively inexpensive retrofit project, along US Highway 301. These flood control projects described in Section 13.2.8 include:

- **Stearns Creek Drainage Improvements (AR-5)** –a new 6-acre detention pond and improvements to a16-acre, three-pond system
- **Whitlock Place and Herndon Street Flooding Relief (AR-6)** – a new 9-acre retention pond
- **Dee Circle and Alafia Ridge Road Drainage Improvements (AR-7)** – a detention pond expansion

AR-1/WQ : US Highway 301 – Park Drive Area Stormwater Retrofit

Untreated stormwater runoff from US Highway 301 enters an Alafia River tributary at this location. An existing depression at this site provides flood relief for a US Highway 301 outfall. This depression could be retrofitted to accept the "first flush" for treatment. Approximately 1.5 acre-feet of runoff could be treated, off-line, at this location. The east-west ditch located to the south of the depression receives drainage from approximately 4000 LF of US Highway 301 south (upstream) of the site.

The inflow structure would consist of two components – a side-flow weir to divert storm flows from the ditch into the treatment area and an inflow channel, protected with riprap at the upstream and downstream sides of the inflow structure. The upstream side will require erosion protection because the "inflow" box will also be used for the outflow when the pond recedes after storms. As water in the ditch rises, water will begin to spill over into the treatment area. When the water in the ditch recedes, flood flows from the treatment area will flow back into the ditch leaving the treatment volume behind.



AR-1/WQ : US Highway 301 – Park Drive Area Stormwater Retrofit

The outflow control structure will be designed to handle the treatment volume only, discharging to the Park Drive drainage system. Excessive flows to the Park Drive system could exceed the capacity of the system; therefore, the outflow structure should not contain openings other than the bleed-down devise. This project, if properly designed, will not increase flood stage and could slightly lower downstream flood stages.

The project cost is estimated at $118,110 including land acquisition. Perhaps a drainage easement, rather than fee simple title, could be obtained to reduce the overall project costs. Reducing or eliminating excavation and planting would further reduce the cost of this project but would also decrease the benefits.

13.4 Natural Systems Enhancement Alternatives

Assessment Methodology

In order to prepare the Alternatives Analysis for the Alafia River Watershed Management Plan, the entire watershed was investigated for undeveloped land, wetlands, natural areas, and potential restoration or preservation opportunities. The boundaries of these areas were identified and mapped on aerial photography (scale: 1" = 200'). The vegetation communities in these areas were then characterized in the field and mapped using a modified version of

the Florida Land Use Cover and Forms Classification System (FLUCCS) (FDOT, 1985). Also, criteria were developed to define and evaluate the existing conditions of each area and to rank each area with respect to the other natural systems in the watershed. These criteria included the presence of undisturbed native vegetation communities, the extent of nuisance vegetation infestation, intact soils and hydrology, the presence of endangered or threatened species, contiguity with other natural systems, and the potential protection riparian habitat. The results of this evaluation are described in Chapter 8.2.4.

The twenty habitat areas described in Chapter 8 were further investigated as to the potential for improvement or preservation. Some of the sites were eliminated after the initial ranking due to the fact that no improvements were needed, or that the improvements needed to raise the ranking of a site were out of the realm of possibility. The Alafia Scrub Preserve is an example of the latter in that what the system lacks most is connectivity to other riparian habitat areas. It is not within the County's power to change this problem because the land that would link these sites to others is developed residential property. Other sites may score low due to the fact that the native vegetative communities do not typically, or are not expected to support endangered or threatened species. This may be the case for some of the floodplain areas that are vital wildlife habitat but do not typically support essential habitat for as many endangered species as would the sand pine scrub, for example. Other sites were eliminated due to changes in availability over the two years since the project's inception. Of the twenty habitat areas evaluated and ranked for existing conditions in Chapter 8, only five remain for evaluation for proposed improvements. The following paragraphs describe the reasoning for the elimination of the fifteen additional original sites.

The Cargill West is part of the permitted plan to relocate or enlarge the gypsum stack that Cargill, Inc. is proposing. This site is unavailable for habitat improvement projects.

The Alafia Scrub Preserve is a relatively small, isolated site on the southern riverbank. While this site may support some nuisance vegetation, the infestation is small and manageable. No other improvements are recommended for this site. Nuisance species are also present to varying degrees on many of the other sites already owned by the County, but for the most part, the diligence of the Natural Resource Department is managing to keep the infestations under control. Nuisance species have been identified on the County properties referred to in Chapter 8 as the Bell Creek Preserve, the Rhodine Scrub, the English Creek site, the Alderman's Ford sites, the Boy Scout Property, and the Alafia River North and South Prong sites.

River Crossing Estates was proposed for purchase and preservation in Chapter 8, but it appears that the owners are already negotiating with the County ELAP program for the purchase of this parcel. The same is true for the Fishhawk Ranch parcels recommended for purchase. Lithia Springs is owned by Cargill, Inc., who lease it to the County for use as a park. This arrangement seems to be working for both parties at this time.

The other remaining sites discussed in Chapter 8 include the Williams Property, Buckhorn Springs, the John Moore Road site, Balm-Boyette Scrub site, and Triple Creek Ranch. These are all discussed in this section as sites that warrant purchase and preservation, restoration, or both.

To determine the candidate sites for the improvements recommended in this chapter, target conditions were developed that were compared to the existing conditions described in Chapter 8. The proposed target conditions are discussed in the following paragraphs.

The target conditions were determined assuming that the primary benefits to be achieved by the study are wildlife habitat preservation and creation. Each site was analyzed to determine the improvements that could be implemented to achieve the desired benefits. Target conditions vary for each site, because the existing conditions of each site must be taken into consideration. In most cases, the emphasis of the target condition for each habitat area is to preserve or enhance existing conditions to achieve the desired benefits. In some cases where the former character of the habitat is unknown or of little value, and the existing conditions are such that little or no habitat is provided, the site requires significant changes in vegetative character to provide benefits. An example of this case is the Balm-Boyette Scrub site, where the plan proposes to change highly disturbed uplands into created wetland habitat. The determination of the character of the targeted habitat for the majority of the sites is based on the habitat requirements of listed species.

The optimal conditions for each site were dependent upon the improvements required to create or preserve habitat. These improvements are discussed individually within the description of each habitat. The potential for multiple use and cooperative funding for these projects should be explored. Wetland sites that will be created, restored, or rehabilitated can be used as mitigation for wetland impacts necessary due to the construction of capital improvements projects funded by local governments or state agencies such as the Florida Department of Transportation. Private utility companies such as Florida Power Corporation or Florida Gas Transmission Company can also be approached for funding as alternative mitigation compensation for impacts they may have incurred during expansion. Sites that would qualify as potential regional mitigation banks include the Balm-Boyette Scrub Habitat Restoration project, the Pringle Branch Purchase and Restoration project, and the wetlands recommended for creation on the Williams Property.

The xeric parcels may be used as gopher tortoise relocation areas, depending upon the specific conditions of each site. Local herpetological experts and the Florida Fish and Wildlife Conservation Commission Wildlife Habitat Guidelines should be consulted prior to any relocation planning.

Some of the natural systems improvements discussed in this section do not require the purchase of land or extensive restoration activities. During the information gathering process of this study, local experts and residents were interviewed to gather ideas for habitat improvement. Three people were especially helpful in making recommendations; Ann Paul of the National Audubon Society, and Sheryl Bowman and Rob Heath of the Hillsborough County ELAP program. Examples of these recommended projects include the proposed Redfish Nursery Expansion Project, the Balm-Boyette Wildlife Underpass, and the Erosion Control Demonstration at the Riverview Community Center. These projects are all discussed in this section.

The chemical treatment of nuisance vegetation is recommended for many of the habitat areas. A permit is usually required for the treatment of extensive areas, and often a licensed applicator is required. Manual removal can usually be undertaken without a permit, but

contracting experienced maintenance personnel is highly recommended. A Nuisance Species Maintenance and Management Plan is provided in Chapter 15.6.

The major objective of the Alafia River Watershed Management Plan is to develop solutions to the problems identified in the previous sections of this report. This section will provide a summary of the problems identified within each individual subwatershed and a discussion of proposed solutions and/or improvements with respect to natural systems elements, such as the conservation of wildlife habitat, the preservation of green space corridors, and the protection of endangered and threatened species. The types of projects identified are either acquisition recommendations, or suggestions for restoration and enhancement projects. The sites recommended for acquisition are depicted in Figure 13.4-1 (Map Appendix 2), and the recommended restoration and enhancement projects are depicted on Figure 13.4-2**.**

13.4.1 Buckhorn Creek Subwatershed

The Buckhorn Creek Subwatershed is a 7.5-square mile watershed located in the southern portion of the community of Brandon in southern Hillsborough County. For a detailed description of the location and physiography of the Buckhorn Creek subwatershed, please refer to Chapter 5.

Natural Systems Problems Identified

The Buckhorn Creek Subwatershed has the highest percentage of residential land use, with over 40% of the total 4,774 acres in medium to high-density residential areas. The commercial and service areas are also expanding to accommodate the increase in population. Consequently, there is little land left for wildlife habitat, in fact only about 15% of this subwatershed's land area remains undeveloped. Much of this undeveloped land is in small, fragmented, isolated patches surrounded by development. One notable exception is the Buckhorn Springs site presented in this chapter as an area recommended for purchase, preservation, and restoration.

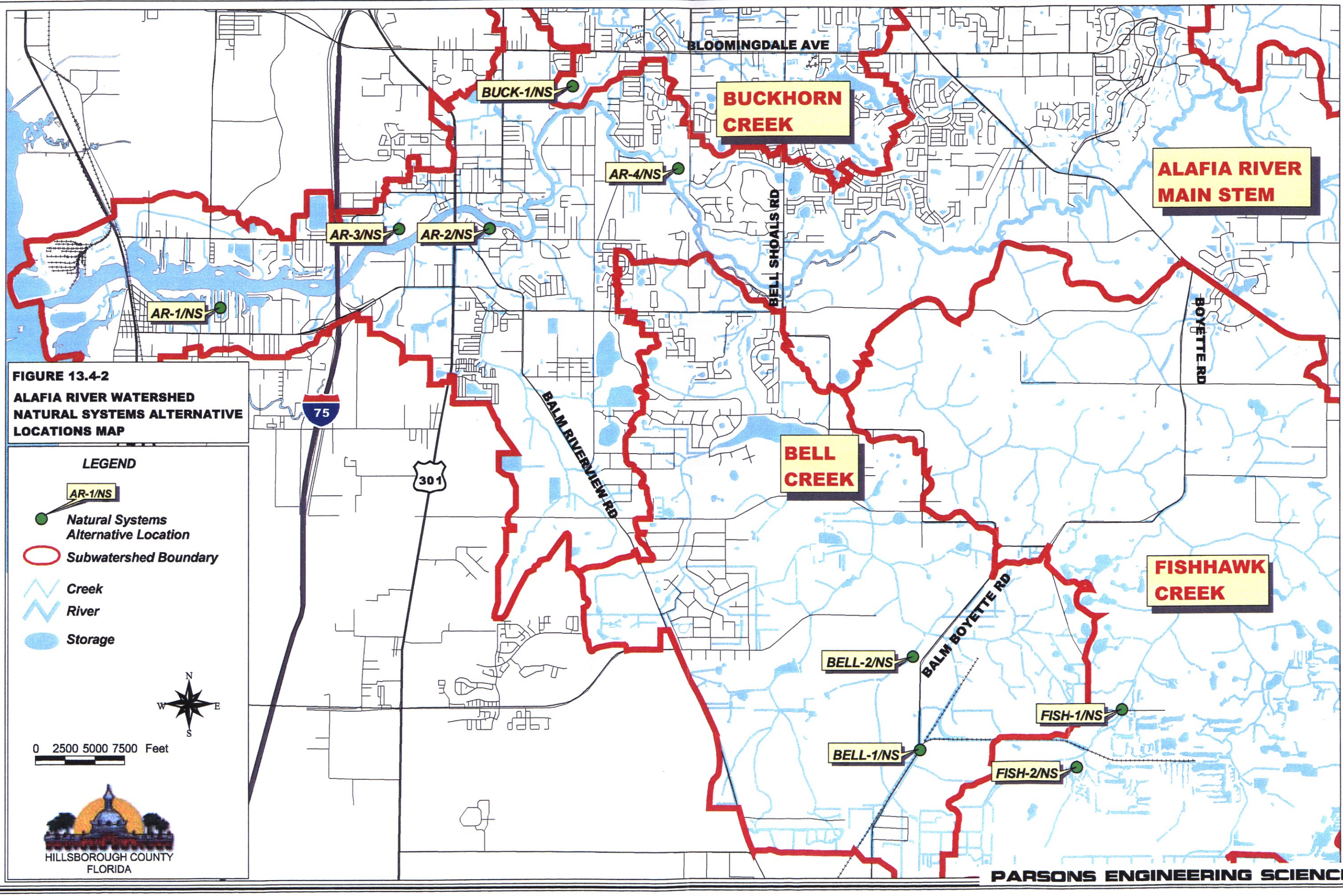


FIGURE 13.4-2
ALAFIA RIVER WATERSHED
NATURAL SYSTEMS ALTERNATIVE
LOCATIONS MAP

Figure 13.4-2 (11x17 back)

Natural Systems Proposed Improvements

BUCK-1/NS Buckhorn Springs Land Acquisition

Project Description: This 149 acre parcel is predominantly floodplain and second growth forested uplands, and it has approximately 3,000 feet of frontage on the northern bank of the Alafia River. It also has several natural springs that flow continually. The area has been unprotected for some time and has been impacted by unauthorized trash dumping, dirt bike use, activities related to the extraction of water for the phosphate industry, and other anthropogenic activities. Nuisance species have become established in disturbed areas.



Project Benefits*:* This site has a lot of potential as wildlife habitat given its location on the Alafia River, and the variety of habitats available. The existing native vegetation should be inventoried and the exotic species removed. If supplemental planting were required to enhance the site, the species listed in Table 13.4-1 would be appropriate. Table 13.4-1 is not meant to be a comprehensive list of suitable species but is intended as a guide to species that are readily available and have been used successfully in the past.



The site would also make an excellent passive recreational area. There are no other passive parks in the vicinity and this site would make a significant contribution to the neighborhood. There is an elementary school adjacent to the northwestern corner of the site, which would facilitate incorporation of educational programs into the use of the site. The river frontage would allow the construction of a canoe/kayak launch facility, and boardwalks could snake through the floodplain with interpretative signage to describe the unusual karst geology.

TABLE 13.4-1
ALAFIA RIVER WATERSHED MANAGEMENT PLAN
VEGETATION RECOMMENDED FOR UPLAND RESTORATION

		TARGET HABITAT				
COMMON NAME	**SCIENTIFIC NAME**	**XERIC OAK HAMMOCK**	**PINE FLAT-WOODS**	**MESIC FORESTS**	**TURKEY OAK SANDHILL**	**SAND PINE SCRUB**
TREES and PALMS						
Red maple	*Acer rubrum*		X	X		
Scrub hickory	*Carya floridana*	X				X
Fringe tree	*Chionanthus virginicus*			X		
Dahoon holly	*Ilex cassine*		X	X		
Yaupon holly	*Ilex vomitoria*		X	X		
Southern magnolia	*Magnolia grandiflora*	X	X	X		
Red bay	*Persea borbonia*		X	X	X	
Sand pine	*Pinus clausa*	X				X
Slash pine	*Pinus ellottii*		X	X	X	
Longleaf pine	*Pinus palustris*		X	X	X	
Sand live oak	*Quercus geminata*	X	X		X	X
Bluejack oak	*Quercus incana*	X			X	X
Turkey oak	*Quercus laevis*	X			X	X
Laurel oak	*Quercus laurifolia*		X	X		
Myrtle oak	*Quercus myrtifolia*	X			X	X
Live oak	*Quercus virginiana*	X	X	X		
Cabbage palm	*Sabal palmetto*		X	X	X	
American elm	*Ulmus Americana*		X	X		
SHRUBS						
Flag pawpaw	*Asimina reticulata*		X	X		
Tarflower	*Befaria racemosa*		X			X
Tough bumelia	*Bumelia tenax*		X		X	X
Beauty berry	*Callicarpa Americana*	X	X	X	X	
Coral bean	*Erythrina herbacea*	X		X	X	X
Garberia	*Garberia heterophylla*	X			X	X
Firebush	*Hamelia patens*			X		
Gallberry	*Ilex glabra*		X	X		
Staggerbush	*Lyonia fruticosa*		X	X		X
Wax myrtle	*Myrica cerifera*		X	X		
Saw palmetto	*Serenoa repens*	X	X	X	X	X
Shiny blueberry	*Vaccinum myrsinites*		X	X	X	
Walters viburnum	*Viburnum obovatum*		X	X		
Hog plum	*Xymenia americana*	X	X		X	X
FORBS						
Wiregrass	*Aristida stricta*		X		X	X
Milkweeds	*Asclepias sp.*	X	X	X	X	X
Gopher apple	*Licania michauxii*		X		X	
Muhly grass	*Muhlenbergia capillaris*		X		X	
Pennyroyal	*Piloblephis rigida*	X	X		X	X
Grass-leafed aster	*Pityopsis graminifolia*		X		X	X
Coontie	*Zamia* sp.	X	X	X		X

13.4.2 Bell Creek Subwatershed

Over 40% of the land area in the Bell Creek Subwatershed is undeveloped and relatively intact, and another 40% is in agricultural lands. The subwatershed supports a diversity of natural land cover types within the 19.74-square mile drainage basin. The creek itself and the associated floodplain are relatively intact, with minimal channelization, and the majority of the riparian habitat for Bell Creek and its tributaries are in public ownership. One of the most significant stands of sand pine scrub remaining in Hillsborough County is found in this subwatershed, in the Balm-Boyette Scrub Preserve. Many of the remaining natural systems in this subwatershed are in public ownership and protected as wildlife habitat and passive recreation areas. Despite efforts to preserve these areas, problems exist that could result in impacts to the endangered species these areas were purchased to protect.

Natural Systems Problems Identified

The publicly owned lands in the Bell Creek Subwatershed include a large portion of the Balm-Boyette Scrub, the Triple Creek Ranch, the Rhodine Road Scrub, and the Bell Creek Preserve. With the exception of two small sections, the majority of the riparian habitat along Bell Creek south of Boyette Road is in public ownership and protected from development. Preserving the land is not enough to protect the endangered species, however. Agricultural "improvements", residential developments, alteration of natural drainage patterns, and other anthropogenic impacts to the lands around the preserved sites have made it necessary to manage these sites to offset the external negative impacts. If these areas were merely fenced and left alone, the habitat would eventually be altered by succession into hardwood species or become overrun with introduced, exotic species. The habitat must be managed to mimic the natural forces that created and maintained the habitat before the anthropogenic impacts occurred. This land management includes the removal and maintenance of introduced vegetation, conducting controlled burns, and protecting and managing the wildlife populations in the preservation areas.

The County has a natural resources management staff, but the resources of this staff are spread very thin. Controlled burns and nuisance vegetation removal are conducted when possible, often with the assistance of volunteers. Large projects, such as the construction of wildlife crossings, the restoration of drainage systems, the removal of trash and asphalt, and other similar projects are often beyond the abilities of the small staff, and contracting projects such as these is usually not within their limited budget.

Natural Systems Proposed Improvements

BELL –1/NS The Balm-Boyette Scrub Wildlife Underpass

Project Description: The Balm-Boyette Scrub is a large contiguous area of protected wildlife habitat intersected by two roadways, Balm-Riverview Road and Balm-Boyette Road. Although the traffic on these roads is relatively sparse, vehicles travel very fast and there is no supplemental lighting. Animals attempting to cross the roads are often unsuccessful. County staff has observed a substantial number of wildlife road kills on these roads and once saw a female bobcat trying to move her litter of three kittens across the road and nearly losing the kittens to traffic.

The Hillsborough County Natural Resources staff would like wildlife underpasses installed in the two roadways that intersect the Balm-Boyette Scrub. Wildlife underpasses are simply culverts or bridges that allow animals to cross under roadways and avoid traffic. Since most animals use the same trails over and over, the usual crossing location could be determined and fencing could be installed to funnel animals into the underpass. Installing an underpass of the correct size is almost as important as installing it in the proper location.

The wildlife that would use the underpass at the Balm-Boyette Scrub would likely require culverts no larger than 36", or large enough to accommodate mammals the size of a bobcat. The culverts should be reinforced concrete or high density polyethylene (HDPE), and could be installed in conjunction with planned roadway improvements. The photo to the right depicts an underpass constructed for use by the desert tortoise and other desert species. Radio-tagged tortoises have been observed taking up to seven days to travel through this underpass, a pace that would have surely cost them their lives if the underpass had not been in place.



Project Benefits: The Balm-Boyette Scrub Preserve is a significant portion of the greenway or habitat corridor along Bell Creek. As discussed in Section 3, Chapter 8, habitat fragmentation is almost as devastating as the outright loss of habitat. Animal populations that are isolated and cannot exchange genes with other populations will lose viability and eventually decline. Roadways can be major obstacles to animals, especially roads that intersect riparian habitat, because most animals travel within the riparian corridor. Wildlife underpasses will reduce the potential for animals being killed as they cross.

BELL-2/NS Triple Creek Ranch Habitat Restoration



Project Description: The ELAP program recently added the 1,100-acre Triple Creek Ranch to the list of County-owned lands. A more detailed description of the existing conditions on this parcel is provided in Section 3, Chapter 8. While the floodplain of Bell Creek is relatively intact, much of the land outside the floodplain has been cleared for cattle ranching. The cattle were removed from the property, which will improve the water quality in Bell Creek. However, as can be seen from the photograph above, without the grazing effect the former pastures have become overgrown with weeds. The County Natural Resources Division mows the area periodically to prevent succession into nuisance hardwoods species and the resultant expensive site clearing costs. Restoration of the pasture areas to pine flatwoods and hardwood hammocks would eventually reduce the maintenance required and significantly improve the wildlife habitat benefits provided in this area, especially when combined with the habitat provided by the contiguous property.

A very conceptual design has been developed for the vegetative restoration of this property based on soils and historic aerials. The design is presented as Figure 13.4-3. The success of the restoration will depend on the careful management of the planted vegetation. Any plantings must be protected from being engulfed by the established nuisance species until the new plantings have matured sufficiently to compete with the nuisance species.

Project Benefits: The benefits of restoring this parcel are substantial. When the plantings mature, the Triple Creek Ranch, combined with the Balm Boyette Scrub, Rhodine Scrub, and the Bell Creek Preserves, will provide over 7000 acres of contiguous wildlife habitat along an important tributary to the Alafia River. The restored riparian habitat will also improve water quality by filtering surface water runoff, and will aid in flood abatement by providing additional floodplain storage.

13.4.3 Fishhawk Creek Subwatershed

The Fishhawk Creek Subwatershed (including the Little Fishhawk Creek Subwatershed) is a 28-square mile subwatershed located in southeastern Hillsborough County. The approximate boundaries of the subwatershed are Boyette Road and Balm-Boyette Road along the west, CR 39 on the east, and SR 672 on the south. Flow originates in the southern and eastern

BELL-2/NS

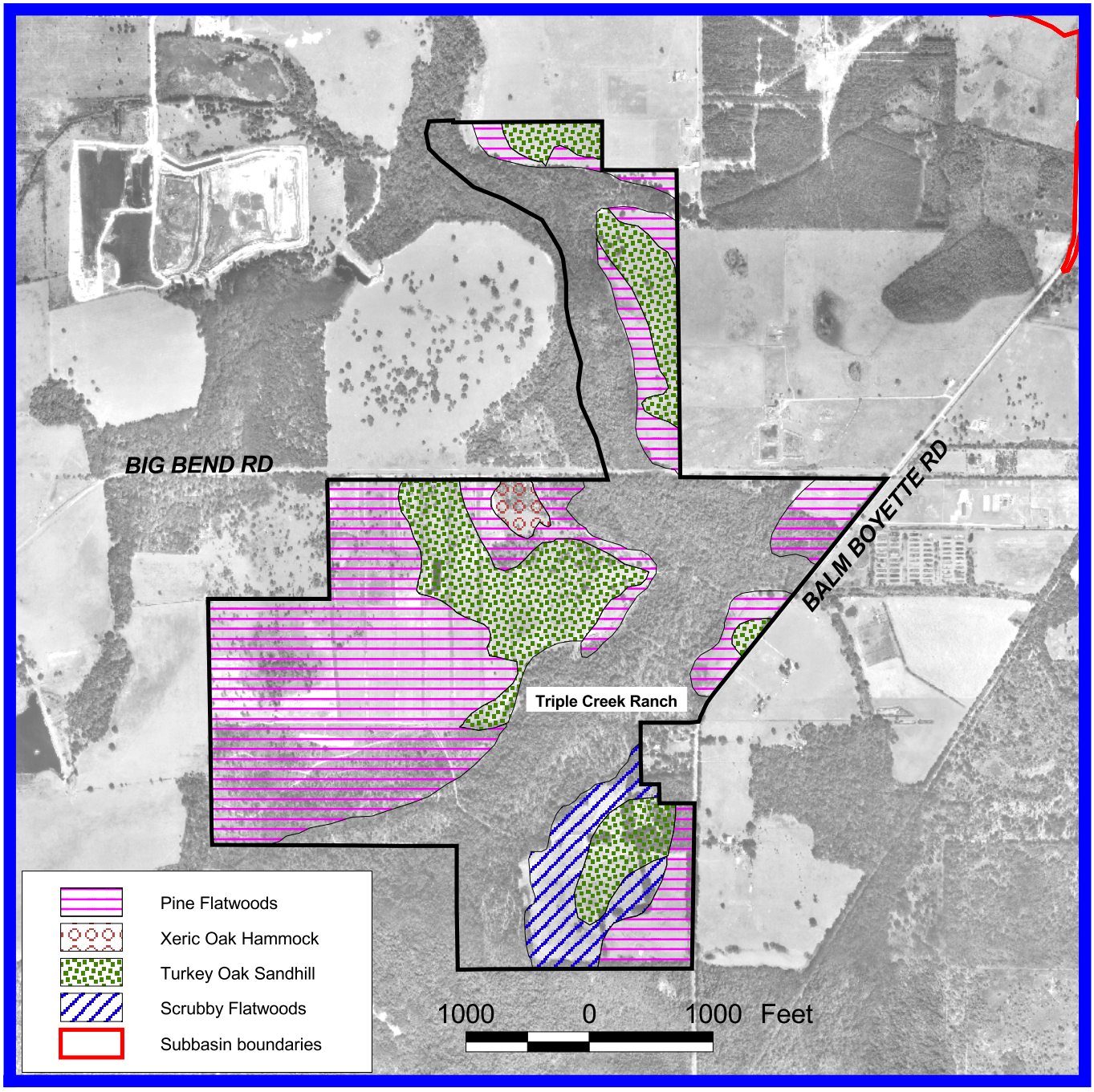


Figure 13.4-3 Triple Creek Habitat Restoration Plan

headwaters of the subwatershed and flows in a generally northwestern direction to the subwatershed outfall at the confluence with the Alafia River, located approximately 2-miles upstream (east) of Bell Shoals Road. For a more detailed description of the subwatershed, please refer to Chapter 5.

Natural Systems Problems Identified

According to the 1995 land use maps, the Fishhawk Subwatershed had the most undeveloped land with over 44% of the natural areas remaining. However, the construction of Fishhawk Road and the initiation of the development of Fishhawk Ranch in the last few years has probably changed that percentage considerably. As with most of the other subwatersheds within the Alafia River basin, the major problem with the natural systems is habitat loss and fragmentation. Until recently, anthropogenic impacts associated with agricultural "improvements" have caused the biggest problems. Activities such as draining and filling wetlands to maximize available pastureland, channelizing waterways to improve drainage, and grading away topsoil and native vegetation to create pasture or crop land have resulted in the biggest losses of habitat. Within the last ten years, however, the development of residential areas is encroaching on the remaining natural areas and soon only those lands in public ownership will remain as natural systems.

Natural Systems Proposed Improvements

During the analysis of the natural systems within the Alafia River Watershed, several areas were identified for potential preservation. The reasons for recommending these areas included one or more of the potential benefits of providing wildlife habitat protection, habitat contiguity, water quality improvement and flood abatement. As stated in the previous paragraphs, the preservation of the remaining undeveloped lands is one of the highest priorities within this subwatershed. The ELAP program and SWFWMD have already identified areas in this subwatershed for potential purchase. These areas are shown on Figure 13.4-1**.** During the evaluation of the natural systems in the Alafia River Watershed, additional areas were identified that would supplement those areas already recommended for purchase. These areas are also shown on Figure 13.4-1 and described in the paragraphs that follow. In addition, an area that is already under County ownership has been identified as a potential area for a water quality improvement and habitat restoration project. This area includes the eastern portion of the Balm Boyette Scrub in the southern portion of the Fishhawk Creek Subwatershed.

FISH-1/NS Pringle Branch Land Acquisition and Habitat Restoration

Project Description: Portions of the land around the upper reaches of Fishhawk Creek and its tributaries have already been purchased for the construction of the proposed Tampa Bay Water (TBW) Reservoir, and for the mitigation associated with the wetland impacts of the reservoir (See Figure 13.4-4). The mitigation area further protects the riparian habitat around the headwaters of Fishhawk Creek by protecting two of the major tributaries, specifically Doe and Pringle Branch. The mitigation area also includes Chito Branch, which is a major tributary to the South Prong of the Alafia River. All of the riparian habitat adjacent to Doe Branch and nearly all of the riparian habitat adjacent to Pringle Branch is now in public ownership, with the exception of two small parcels located between the Balm-Boyette Scrub Preserve and the

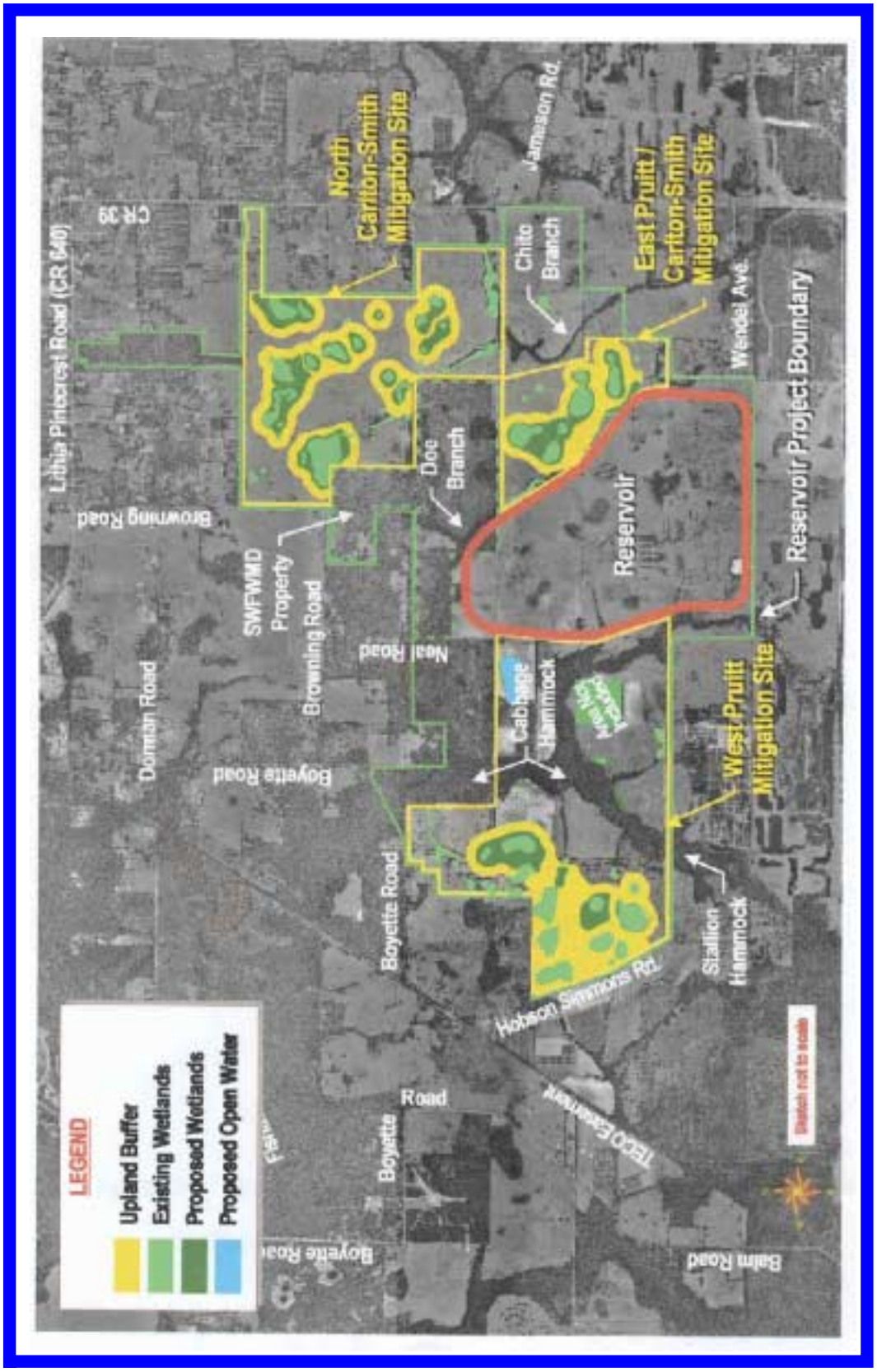


Figure 13.4-4 Proposed Tampa Bay Water Reservoir and Mitigation
Source: Tampa Bay Water, 2001

West Pruitt Mitigation site. It would be appropriate for the County to purchase these parcels, depicted in Figure 13.4-5. These parcels total approximately 400 acres, have a combined market value of around $900,000, and include a fish farm, crop land, several mined pits, and improved and unimproved pasture land.

Project Benefits: Purchase and restoration of these parcels, combined with the parcels already purchased and proposed for purchase by the County, TBW, and SWFWMD, would result in a contiguous riparian corridor along Fishhawk Creek and its tributaries. This corridor would consist of approximately 9 miles of protected habitat, and would provide for the movement of wildlife for breeding and foraging. Water quality would be improved by the filtering of surface water runoff through the riparian forests, and by the removal of the agricultural land uses within the floodplain.

Restoration of this site would require excavating the filled wetlands, filling and grading the fishponds, and planting with appropriate native species. It appears that in existing conditions, the fish farm to the west of Hobson Simmons Road drains across the road to the east and on to the site where a ditch conveys this drainage to Pringle Branch. The conceptual site design would direct this flow into a sump that would then discharge into a slough that meanders through the pine flatwoods. The slough would provide water quality treatment prior to discharging into Pringle Branch. The banks of the existing phosphate pits would be graded to provide littoral shelves for water quality and wildlife benefits. The cropland in the northeast corner of the site would be graded and restored to pine flatwoods.

FISH-2/NS Balm-Boyette Water Quality Treatment and Habitat Restoration

Project Description: The eastern side of the Balm Boyette Scrub Preserve was previously mined and although the area was “restored”, the restoration consisted of little more than flattening some of the more extreme grades. The historical hydrology, vegetation, and topography have not been restored and the area currently appears to be a hilly, grassy pasture with scattered, deeply incised elongated ponds. Water quality in the ponds is poor, and one of the ponds is currently discharging into Pringle Branch through an eroded berm. The site is currently used by dirt bikers who enjoy the challenges of the extreme grades.

Historic aerial photography and soils maps indicate that there were originally two tributaries that flowed through this area to discharge into Pringle Branch. Prior to the mining, the natural vegetation in this area was dominated by sand pine scrub and xeric oak, with pine flatwoods in the lower elevations and mesic hardwoods in the narrow floodplains along the tributaries.

The county proposes to join with the SWIM department of SWFWMD to restore a portion of the area in the interest of improving water quality, restoring habitat, and potentially using the site as a regional mitigation bank. Mitigation may be required for unavoidable impacts to wetlands that may occur as a result of the construction of capital improvements associated with the Alafia River Watershed Management Plan. A conceptual plan for this water quality/habitat restoration area is presented as Figure 13.4-6. This plan works with the existing post-mining grades as much as possible to keep the construction costs within reason. The existing phosphate pits would be graded to create littoral shelves for wildlife habitat and water quality treatment. The topography of the site will allow these restored wetlands to cascade from one into another over riprap berms and then discharge to Pringle Creek.

FISH-1/NS

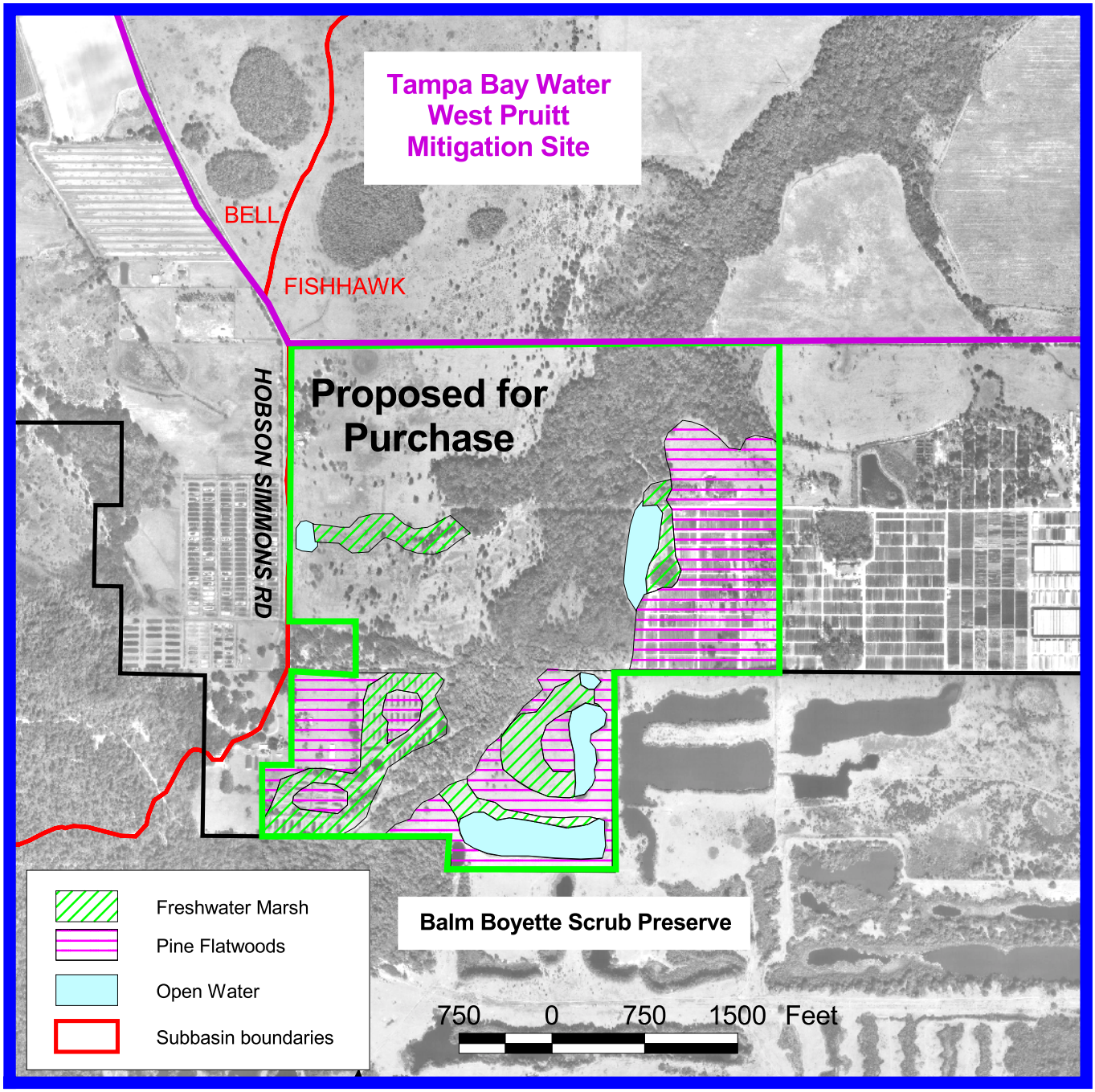


Figure 13.4-5 Pringle Branch Acquisition and Habitat Restoration Site

FISH-2/NS

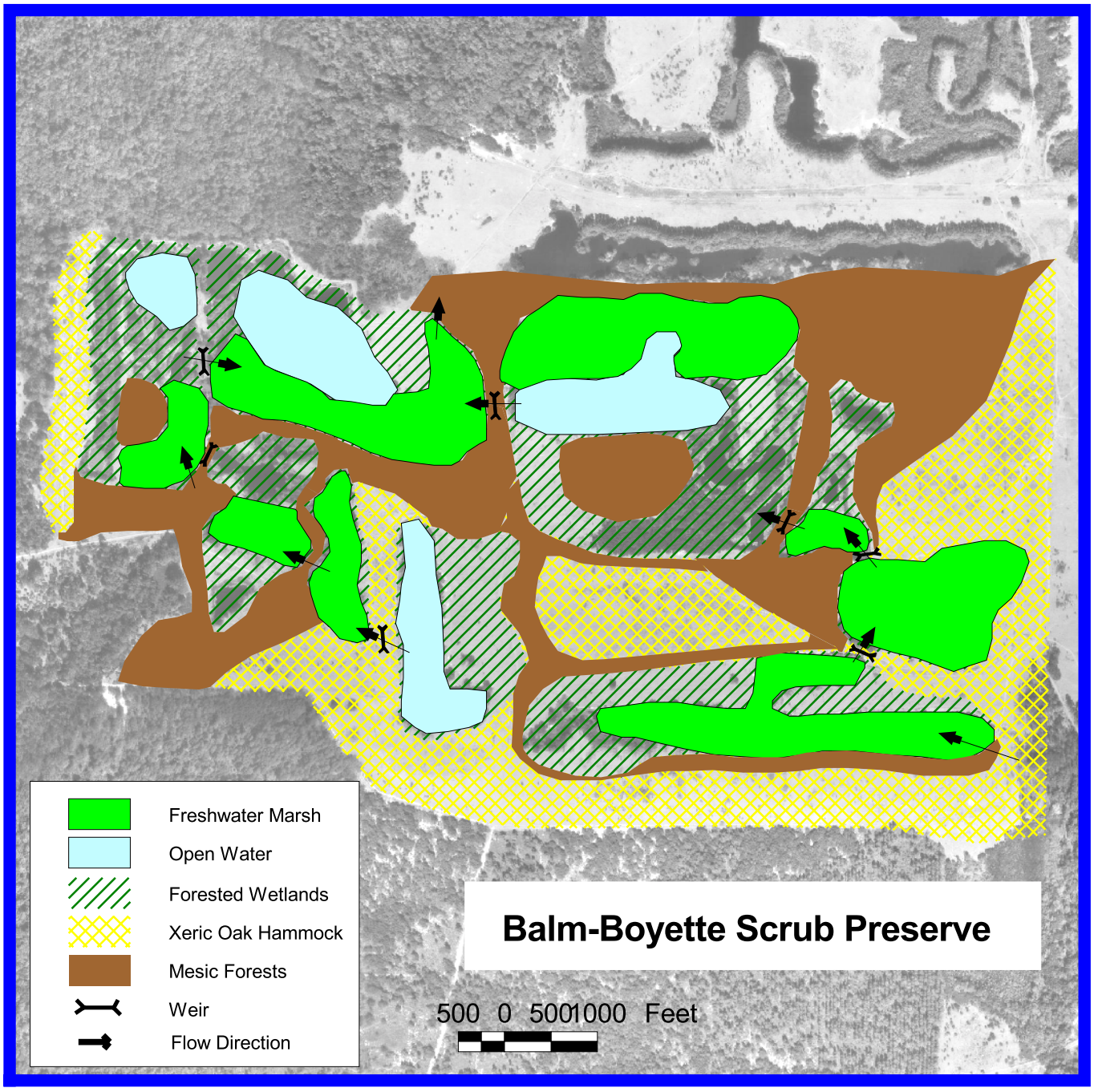


Figure 13.4-6 Balm-Boyette Scrub Preserve Water Quality Treatment and Habitat Restoration Project

Creative grading will provide the potential for a mosaic of habitats within the mitigation area. Some of the existing slopes in the uplands would be maintained for recreational dirt bike use, but the remaining uplands would be graded and planted with native species.

Project Benefits: The benefits of this project would be significant. The restoration project would add approximately 330 acres of wildlife habitat to the Balm-Boyette Scrub Preserve, including 160 acres of wetlands and 170 acres of uplands. The wetlands would include restored forested floodplain, open water, and freshwater marshes, and the uplands would include restored turkey oak/longleaf pine sandhill, sandpine scrub, flatwoods, and dry prairie.

Restoring previously mined lands has met with mixed results in the past, due to the unusual soil conditions. It is therefore recommended that test plots be established along an elevational gradient and that these plots be planted with a variety of native species. These plots should be monitored to determine which plant species are successful in adapting to the on-site conditions, and at that point a planting plan would be prepared.

13.4.4 Turkey Creek Subwatershed

The Turkey Creek Subwatershed is located in the north-central portion of the Alafia River Watershed. The subwatershed drains 43.7 square miles and is roughly bounded by the following landmarks: Plant City to the northeast, Rev. Dr. Martin Luther King, Jr. Boulevard to the north, Henry George Road to the southeast, Keysville Road to the south, and Dover Road to the west. Turkey Creek Road bisects the subwatershed into approximately equal east and west halves; State Road 60 bisects the subwatershed into approximately equal north and south halves.

Natural Systems Problems Identified

The main problems affecting the natural systems within the Turkey Creek Subwatershed are those related to mining, hazardous waste, agricultural “improvements”, and urban sprawl. These anthropogenic activities have resulted in habitat loss, fragmentation, and degradation. Most of the historic creek bed has been channelized, and the majority of the historic floodplain has been mined or otherwise altered for development. This subwatershed has the highest percentage of land use attributed to open land, but the majority of this is in former unreclaimed and reclaimed phosphate mines. Although 29% of the subwatershed has been designated as undeveloped on the County land use maps, most of this undeveloped land is found in isolated fragments scattered throughout the subwatershed. There are no significant contiguous tracts of undeveloped land that may provide wildlife habitat and the only land in public ownership are the large tracts of former phosphate mines. One such phosphate mine is the Medard Park, which has been turned into a recreation area as well as a potable water reservoir.

No opportunities for large restoration or preservation projects were identified in this subwatershed. Several previously mined areas were considered for habitat enhancement, but the costs involved with purchasing the land as well as constructing the habitat were prohibitive. While there were several small areas that would have been appropriate for habitat enhancement, none of those areas would be considered a significant contribution to the regional wildlife habitat, due to their small size and isolation from other habitat areas.

13.4.5 English Creek Subwatershed

The English Creek Basin consists of approximately 38.4 square miles and is located in the east portion of Hillsborough County. Interstate 4 to the north, Coronet Road to the west, and the Lakeland Regional Airport to the northeast roughly define the area. Flow originates in the eastern and northern headwaters of the watershed and flows in a southwesterly direction. The watershed outfalls at the confluence of English Creek with the North Prong of the Alafia River. The confluence is located approximately 6.0 miles upstream of the crossing at County Road 39.

The majority of the land use within the watershed has been modified for agricultural, phosphate mining and residential development. Historically, the upper watershed consisted of a series of lakes, isolated wetlands, and depressions that flowed from one to the other with eventual discharge to the main stream segment. These natural streams and drainage ways have been channelized north of the creek's confluence of Hamilton Branch.

Natural Systems Problems Identified

As with the other subwatersheds within the Alafia River Watershed, the major natural systems problems in the English Creek Subwatershed are the degradation, fragmentation, and loss of habitat. Half of the land area within the subwatershed has been "improved" for agriculture. In the northeast part of the subwatershed the numerous wetland areas have been rim-ditched and drained to increase land for pasture. Other wetlands have been filled to create cropland or groves. Many wetlands have been impacted by sediments washing in from improperly managed farmland. In the northwest, the land has been significantly altered due to phosphate mining. South of the confluence with Hamilton Branch, the natural channel of the creek has been retained and some floodplain is still present. There are, however, no large tracts of undeveloped land that could be purchased and preserved other than the land that is already in public ownership. For this subwatershed, the most important objective should be the management and stewardship of the undeveloped land remaining.

13.4.6 North Prong Subwatershed

The North Prong Subwatershed consists of approximately 102.3 square miles and is located east of English Creek; south of Interstate 4; west of State Road 37; and north of Porter Road. Approximately 93.6 square miles of the 102.3 square mile watershed is located within Polk County. Flow originates in the eastern headwaters of the watershed and flows in a generally western direction. The watershed outfalls at the confluence with the South Prong of the Alafia River. The outfall is located approximately 0.5 miles east of County Road 39.

Almost half of this subwatershed has been altered due to phosphate mining, and another 15% has been subject to agricultural "improvements". The majority of the phosphate mining occurred within the 93% of the subwatershed that lies in Polk County. The main stem of the North Prong and most of the tributaries are channelized within Polk County, but the portion of the creek between the Hillsborough County line and the creek's confluence with the South Prong is relatively natural. The natural floodplain is also relatively intact within this segment, but this is not the case in Polk County where the stream is little more than a managed canal.

Natural Systems Problems Identified

The obvious problems with the North Prong Subwatershed are the active and historic mining projects within Polk County. Other than trying to improve mine restoration technology, little can be done about the impacts on natural systems created by the phosphate industry. The habitat degradation in Polk County, however, stresses the importance of habitat preservation downstream in Hillsborough County. The floodplain areas between the County line and the confluence with the South Prong have been identified as priority acquisitions by the SWFWMD and ELAPP (SWIM 2001).

Natural Systems Proposed Improvements

The sites within the Hillsborough County portion of the North Prong Subwatershed that are appropriate for purchase and preservation have been identified by SWFWMD and ELAPP and negotiations are underway. No other large contiguous tracts of undeveloped land are available within this subwatershed.

13.4.7 South Prong Subwatershed

The South Prong Subwatershed consists of approximately 124.2 square miles and comprises the southeast portion of the Alafia River Watershed within Hillsborough County. The area is roughly defined by County Road 39 to the east; the Hillsborough / Manatee line to the south; and State Road 37 to the west. Flow originates in the eastern and southern headwaters of the watershed and flows in a generally northwest direction. The watershed outfall is at the confluence with the Alafia River. The outfall is located approximately 0.5 miles upstream of the Alafia River's crossing at County Road 39.

Over 50% of this subwatershed has been altered due to mining activities. Some of the mined lands have been restored and converted to farmland but a significant proportion remains as sludge pits and overburden. Historically, the headwaters of the South Prong originated in isolated wetlands, swamps, and high groundwater depressional areas that were hydraulically connected during large storm events. Many of these systems have either been filled, drained, channelized or mined and very little of the historic drainage pattern exists.

Natural Systems Problems Identified

As stated in the previous paragraph, over 50% of the South Prong Subwatershed has been impacted by mining activity. Nearly the entire subwatershed that lies within Polk County has been permanently altered by mining activities. Within both counties, a narrow band of relatively undisturbed forested floodplain borders the main stem of the South Prong and the major tributaries, but the mining was conducted to the edge of the canopy, leaving very little buffer. Active mining is still occurring in the eastern portion of the subwatershed, and recently several hundred acres of highly valuable sand pine scrub habitat was lost to the dragline.

Other natural systems problems in the South Prong Subwatershed include the intensive farming in the southwestern section along Balm-Picnic Road. The farming activity in this area does not present the same problems as it does in other subwatersheds such as Turkey Creek

and English Creek, because a buffer of riparian habitat has been maintained to decrease or prevent pollutants from being washed into the creek and tributaries.

Natural Systems Proposed Improvements

ELAPP, SWFWMD and other state entities have joined forces to purchase the majority of the northern reach of the South Prong to protect it from the degradation that occurred as a result of the mining and agriculture occurring in the southern reach. With a few exceptions, the native soils on this preserved land are intact, so it is anticipated that the natural vegetation communities will regenerate eventually, with a minimum of maintenance needed to keep nuisance species from becoming established. Some previously mined lands are also present near the northern boundary of the subwatershed, but these lands were mined more than fifty years ago and have since regenerated to provide wildlife habitat. These mined lands would not likely benefit from an engineered restoration plan that would require another fifty years to mature.

No other suitable tracts of land are available for preservation within this subwatershed. The large tracts of mined lands are predominantly in transition to reclamation and monitoring for success as required by the FDEP. No improvements that would significantly benefit wildlife habitat or endangered or threatened species were identified for this subwatershed.

13.4.8 Alafia River Main Stem Subwatershed

The Alafia River Main Stem Subwatershed encompasses the Alafia River main channel from its outfall at the south end of Hillsborough Bay upstream to the confluence of North and South Prong located just east of County Road 39. The majority of the 49.7 square-miles of the subwatershed drains into the river directly through 42 small, previously unnamed creeks. Rice Creek, approximately 2.27 miles in length, is the only named waterway in this subwatershed system.

The Alafia River flows from east to west and the main channel exhibits a very flat slope of 1.76 feet per mile. Most terrain ranges from nearly level areas with numerous intermittent marshes, swamps, sinks, lakes, and springs, to gently undulating areas that extend from the northwestern corner southeastward across the subwatershed. For a detailed description of the hydrology and physiography of the subwatershed, please refer to Chapter 5.

Natural Systems Problems Identified

As with the other subwatersheds, the biggest problems with respect to natural systems are habitat loss, fragmentation, and degradation. In keeping with people's obsession for waterfront living, much of the land in the lower Alafia River has been developed for residential use, and undeveloped areas have been altered to accommodate agricultural uses and phosphate processing. However, there are still some areas of relatively intact riparian habitat east of Bell Shoals Road, and west of the Polk County line.

In addition to the riparian habitat, this subwatershed includes the estuarine portion of the river and some of the most potentially important wildlife foraging, breeding, and nesting areas. The estuarine system is not only important to the wildlife in the Alafia River, it is also important to

the environmental health of Tampa Bay. The discharge from this subwatershed contributes a significant portion of the freshwater component of Tampa Bay. This subwatershed also contains some of the most important recreational areas in the entire Alafia River Watershed.

Because of the important riparian and estuarine habitat this subwatershed provides, efforts should be concentrated on the preservation of the environmentally sensitive lands already in public ownership, and the purchase and restoration of suitable lands in private ownership.

Natural Systems Proposed Improvements

AR-1NS Alafia River Redfish Nursery



Project Description: This project is located on the southern shore of the Alafia River, between Peninsular Drive and Bay Drive, within an electrical transmission corridor. This section of this electrical transmission corridor was originally slated for the development of single-family homes, but was purchased by TECO to accommodate the utilities. Prior to the TECO purchase, however, a finger canal was excavated to provide the future homeowners with access to the Alafia River. The canal remains in the easement and has become an excellent nursery area for redfish or red drum (*Sciaenops ocellatus*). The mouth of the canal, as shown in the photograph above, is shallow enough to preclude the entrance of predatory fish, but deep enough to allow the young redfish to come and go. Redfish are important to commercial and recreational fisheries and populations have been steadily declining due to overfishing and loss of habitat. The larvae and juvenile redfish require shallow, low salinity areas like the canal shown above, during the first four years of their life. Once they reach approximately 30 inches, the fish have matured and they migrate offshore to join spawning populations.

State and National Audubon Society representatives have suggested enhancing this area by excavating pockets on either side of the finger canal, which would enlarge the available nursery habitat. In addition, similar finger canals could be created in the electrical transmission corridor on the north side of the river. Some surveying would be required prior to the excavation of the finger canals to determine the optimal depth, but the survey and excavation would be the only requirements for this project. Construction costs would be nominal and could be defrayed by the sale of the excavated material as fill dirt.



Project Benefits: The implementation of this project is expected to increase the redfish population within the Alafia River and Tampa Bay. The nursery will provide a protected area for the larval and juvenile fish to forage until they are mature enough to migrate offshore. This project will benefit the natural systems within the Alafia River Watershed, but will not likely benefit or adversely impact other elements of this plan, such as water quality improvement or flood abatement.

AR-2NS Riverview Community Center Erosion Control Demonstration



Project Description: This proposed project is in Riverview at the Riverview Community Center on Park Drive. The project is jointly funded by the Florida Department of Environmental Protection (FDEP)/Gardinier Trust Fund, the Hillsborough County Pollution Recovery Fund, and a grant from the Audubon Society. The project was planned as a demonstration to show waterfront residents different types of erosion control and bank stabilization techniques, with additional information regarding costs and wildlife habitat benefits. The project was permitted and funded, but a change in the design requested by FDEP led to project delays and concerns on the part of Audubon. The estimated new project costs have since doubled to $200,000 (Tampa Tribune 2001)



Project Benefits: As can be seen in the photo to the right, the riverbank in the vicinity of the Riverview Community Center has been eroding significantly over the years despite the riprap and other material place on the banks. This bank erosion creates sedimentation problems downstream which affects benthic organisms and impacts fish foraging and nursery habitat. The implementation of this project will obviously benefit water quality and wildlife habitat by reducing bank erosion and thereby reducing turbidity and sedimentation. It will also provide the residents in the area with options for the preservation of the shorelines and the creation of habitat on their own property.

AR-3NS Williams Property Land Acquisition and Habitat Restoration

Project Description: This site is approximately 90 acres and is located between the Alafia River north shore and Riverview Drive, east of I-75. This site consists predominantly of improved pasture with a small amount of slash pine flatwoods, and three highly disturbed wetlands. The southern boundary of the site borders on the Alafia River. This site lies within the radius of critical foraging habitat for the white ibis breeding population, as discussed in Section 2, Chapter 8. There is an excellent potential for the creation of shallow foraging ponds for wading birds as well as for the restoration of upland wildlife habitat.

Project Benefits: The development of the site for wildlife habitat uses could be enhanced by creating a passive recreation area that would include an education/interpretation facility. A boat ramp, canoe launch, picnic area, and other non-invasive facilities would also enhance the park. A conceptual plan for the construction of a park and the creation and planting of freshwater and upland wildlife habitat on this site is provided in Chapter 15.

AR-4NS John Moore Road Habitat Restoration and Preservation

Project Description: This site is likely destined to become a part of the Four Winds Estate subdivision if not purchased and preserved. The site is approximately 130 acres and is wooded floodplain and cleared former fish farms. It provides approximately 3,000 linear feet of shoreline along the river and if restored, would make an excellent passive park. Restoration would require the removal of nuisance vegetation, including air potato, wild grape, and other noxious vines, and planting of native understory species to reduce erosion. Vegetation recommended for planting in the floodplain is included in Table 13.4-2.

Project Benefits: The purchase, restoration, and preservation of this parcel would significantly improve the wildlife habitat in the region by preserving a portion of the Alafia River Greenway, the contiguous belt of green space that the Hillsborough County Greenways Program is trying to achieve from the Polk County line to the mouth of the river. It would also provide important riparian habitat, and water quality benefits. As a passive park, certain amenities such as boardwalks, canoe launches, and a nature interpretation center could be added. A conceptual habitat restoration plan in this location is provided in Chapter 15.

13.4.9 References

Green, Susan M. 2001. *Meeting Addresses Alafia River Erosion*. Tampa Tribune, September 30, 2001.

Southwest Florida Water Management District (SWFWMD), 2001. *Five Year Land Acquisition Plan*. SWFWMD Brooksville, Florida

Bowman, Sheryl, ELAPP staff, personal communication.

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CHAPTER 14

PUBLIC MEETING NUMBER 2

As stated in Chapter 10, public input is a critical component in the development of the Alafia River Watershed Management Plan. The purpose of the management plan is to meet the needs and address the concerns the residents within the watershed face with respect to flooding problems, water supply needs, water quality needs, and the dwindling natural resources. In order to prepare a plan that addresses the needs of these residents, the County has solicited comments via an internet web site, and in a series of public meetings. This chapter describes the second public meeting and addresses the comments collected at that meeting.

Public Meeting Format

The second public meeting was held on August 16, 2001 at the Riverview Civic Center, and was attended by approximately 34 people. Mr. Martin Montalvo of the Hillsborough County Stormwater Management Division provided a brief introduction to the purpose of the meeting, which was to present the areas identified as problem areas and to be solicit input from the residents. Mr. Montalvo then encouraged the meeting attendees to disperse and meet with the Parsons and County staff members present at the meeting, review the exhibits provided and submit questions or comments to the staff.

As with the first meeting, the staff members present represented the three main elements of the Alafia River Watershed Management Plan:

- Flood Control,
- Water Quality, and
- Natural Systems.

Stations were set up with exhibits specific to each of these three elements and personnel from the County and Parsons were present to answer questions. In addition, a Geographic Information System (GIS) station was set up so that the attendees could locate their property and easily identify problems areas. Forms were prepared to facilitate the preparation of comments, with example comments provided to indicate the type of problems that would be within the scope of the project. Each comment was numbered and the general location of the problem was mapped. Abbreviated summaries of the comments submitted from the public during this phase of the project are provided in Table 14-1 below, with a response.

TABLE 14-1
ALAFIA RIVER WATERSHED PUBLIC MEETING NUMBER 2 COMMENTS

NUMBER	PROBLEM TYPE	COMMENTOR	COMMENT	RESPONSE
24	Flood Hazard	Derek L. Doughry 10804 Desoto Road Riverview, FL 33569	During heavy rains, Providence Road is under water from Watson Road south to Crescent lake Drive. This happens several times a year.	This problem has been identified as a priority issue in the plan. (See AR-4)
3	Water Quality	Greg Zimmer 11320 McMullen Loop Riverview, FL 33569	Delta of sand sediment is forming at bend in Alafia River, east of Rice Creek. Sediment material is from construction site upstream at Morrison Homes Development on McMullen Road.	The EPCHC should be notified of the violation. Call 272-7104.
26	Flood Hazard	Susan Morris 7508 Alafia Drive Riverview, FL 33569	During heavy rains, Providence Road is under water from Watson Road south to Crescent lake Drive. This happens several times a year.	This problem has been identified as a priority issue in the plan. (See AR-4)
28	Flood Hazard	Susan Morris 7508 Alafia Drive Riverview, FL 33569	Alafia Drive and Desota Road. Access to a private home of an elderly resident floods due to lack of maintenance in drainage ditch.	Watershed Management Plan will address maintenance needs.
13	Flood Hazard	Darryl Wagner 4510 Squirrel Run Way Valrico, FL 33594	Chronic flooding problems within the neighborhood of River Drive and Squirrel Run Way. Houses built in the floodplain with inadequate drainage; yard and road flooding.	This problem has been identified as a priority issue in the plan. (See AR-3)
39	Flood Hazard	Jim Mortimer 4505 Squirrel Run Way Valrico, FL 33594	Chronic flooding problems within the neighborhood of River Drive and Squirrel Run Way. Houses built in the floodplain with inadequate drainage; yard and road flooding.	This problem has been identified as a priority issue in the plan. (See AR-3)
4	Water Quality	Bob Minthorn 8613 Magnolia Street Gibsonton, FL 33534	Magnolia Lagoon suffers from poor water quality due to lack of circulation and leachate from inadequate sewage treatment systems in adjacent trailer park.	
	Natural Systems	Bob Minthorn 8613 Magnolia Street Gibsonton, FL 33534	Wants to see an educational booklet prepared and made available to homeowners along the river providing information on how to protect water quality, prevent erosion, and what plants could be installed to benefit habitat.	See recommendations section (Chapter 15.4) of this report.
	Flood Hazard	Jim Mortimer 4505 Squirrel Run Way Valrico, FL 33594	Wants to see better maintenance of existing ditches and culverts within the watershed.	Watershed Management Plan will address maintenance needs.

CHAPTER 15

PROPOSED PLAN AND LEVEL OF SERVICE

15.1 INTRODUCTION

As discussed previously in Chapter 13, upon the successful completion of the development and calibration of the detailed hydrologic and hydraulic model of the Alafia River Watershed primary and secondary drainage systems, the next step was to apply the model to assess the performance of the basin-wide drainage facilities for a given set of design storm events. Results of these simulations were then analyzed with respect to the County's adopted flooding level of service criteria (LOS) to identify locations within the watershed where the LOS are not being met. Identified water quality and natural systems problems and issues were also evaluated as a part of this basin-wide assessment. Alternatives were developed and evaluated to address the identified problem areas. This chapter presents the preferred alternatives and recommendations for the implementation of a watershed management plan for the Alafia River Watershed in Hillsborough County.

15.2 PROPOSED PLAN AND LEVEL OF SERVICE

15.2.1 Flood Control Projects

The proposed alternative recommendations from Chapter 13 were analyzed and evaluated using the design storm events described in Chapter 4 to establish a proposed level of service for each subwatershed – collectively, these projects comprise the proposed condition "master plan". Model network maps for the proposed condition are provided on Figures 15.2-1 through 15.2-8 located in the Map Appendix 2, and the model input and results are located in the technical appendix. Flood profiles for the proposed condition are provided on Figures 15.2-9 through 15.2-16 located at the end of this chapter.

Except for the Buckhorn Creek Subwatershed, the proposed projects were designed with the objective of obtaining the target level of service of 25-year, LOS B condition. This is therefore the proposed LOS criterion for the Alafia River Watershed. For the Buckhorn Creek Subwatershed, the proposed flood control projects were designed with the goal of achieving a 25-year, LOS B condition at those locations for which alternatives were considered. Recall that the County's adopted LOS for Buckhorn Creek is a 10-year, LOS B, and problem areas were identified based on this criterion. With the implementation of the proposed recommendations, there will still be locations where a 25-year, LOS B condition is not met. Therefore, the proposed flooding level of service for the Buckhorn Creek Subwatershed is a 10-year, LOS B condition.

The “Project Fact Sheets”, located at the end of this chapter, provide detailed summaries of the preferred alternatives for the flood control projects recommended as a part of the Alafia River Watershed Management Plan. These sheets provide summaries of the information discussed in Chapter 13, and the reader is referred there for more details and the project location map (Figure 15.2-17). On these sheets are the name and location of the project, a location map, problem summary, description of the preferred alternative solution, environmental issues, and a project cost estimate.

15.2.2 Water Quality Improvement Projects

Recommended water quality improvement projects for the Alafia River Watershed Management Plan are summarized on the ”Project Fact Sheets” located at the end of the chapter. These fact sheets contain a conceptual design, problem description, project description, and the estimated cost to implement the projects. Most of the proposed projects are surface water treatment marshes. Some of these projects involve the excavation of uplands for creation of treatment areas and some involve retrofitting existing ponds or other depressional areas for water quality improvement. These sheets provide summaries of the information discussed in Chapter 13, and the reader is referred there for more details and the project location map (Figure 13.3-1 or Figure 15.2-17).

Runoff from subbasins that drain to one of the proposed water quality improvement projects will experience water quality improvement. In some cases the improvement may be sufficient to upgrade the LOS at the subbasin level. These proposed projects do not, however, provide sufficient coverage to effect the subwatershed-wide LOS. Considering one inch of runoff as ideal treatment coverage and calculating the percent of ideal treatment provided by each of the proposed BMP's, shows a range of 0.08% to 2.57% of ideal treatment provided by the proposed BMP's for the respective subwatersheds. Factoring these percentages with expected pollutant removal efficiencies shows that, at a subwatershed level, significant additional water quality improvement measures are needed to affect a LOS improvement.

15.2.3 Natural Systems Enhancement Projects

Recommended natural systems enhancement projects for the Alafia River Watershed Management Plan are summarized on the “Project Fact Sheets” located at the end of this chapter. These fact sheets contain a conceptual design, project description, and the estimated cost to implement the projects. These sheets provide summaries of the information discussed in Chapter 13, and the reader is referred there for more details and the project location map (Figure 13.4-2 or Figure 15.2-17).

15.3 PRIORITIZED LIST OF RECOMMENDED PROJECTS

The successful implementation of the Alafia River Watershed Management Plan will require a logical plan or order for the construction of the recommended stormwater management, environmental enhancement, and water quality improvement projects which were developed and documented in the previous report sections. To accomplish this task, sets of comparative evaluation criteria were identified and project evaluation matrices were developed to rank the various projects and prioritize their preferred order of implementation.

15.3.1 Flood Control Projects

The evaluation criteria which were selected as a means of subjectively grading the relative merits of the recommended flood control projects are discussed below. Within each evaluation criteria category, individual projects were graded on a scale from 1 to 10, with the lowest ranking indicating no real benefit and the highest indicating a high beneficial value.

Flood Control Benefits. The relative flood control benefits of an individual project relate to the severity of the flooding problem at that location, if any, and its frequency and areal extent. A project with only a marginal flood control benefit would be rated at 1, while a project designed to relieve chronic flooding of residential structures over a large area might be rated at 10. A project designed to meet the flooding LOS criterion for a local residential street would receive a lower grade than a project designed to upgrade a major arterial roadway to meet the LOS criterion.

Ecological Benefits. The potential ecological benefits of individual projects are ranked based on evaluations of the anticipated improvements to wildlife habitat that would be realized after project construction. Factors such as size of the affected area, current quality and ecological conditions, and proximity to other habitat areas are considered in the evaluation of benefits and the relative ranking of projects. Areas that currently provide no habitat, but will provide significant habitat upon project completion, would rank highest in the ranking matrix. Conversely, those projects that will have no habitat impacts, such as the replacement of culverts for flood control, would rank the lowest.

Water Quality Benefits. The relative water quality benefits of an individual project reflect the ability of the project to capture and remove pollutant loadings prior to discharge into downstream waterbodies. Those projects with little or no real water quality benefits receive a 1 ranking, while a project specifically designed to provide a high level of treatment of stormwater runoff from a large drainage basin which currently has little or no such facilities would receive a ranking on the order of 10.

Recreational and Educational Benefits. The recreational and educational benefits of a project are aspects of multipurpose projects which, in addition to alleviating flooding, ecological, water quality, and/or channel erosion problems, provide new

opportunities for the general public in the form of picnic areas and shelters, trails, nature park, fishing, boating, etc. Projects with no real benefits would receive a ranking of 1, and those with a high level of recreational and educational opportunity would be assigned a ranking of 10.

Relative Benefits to Cost. The relative ratio of benefits to cost, as used herein, is a subjective evaluation of an individual project that relates the perceived magnitude of the identified problem(s) being alleviated by the project to the expenditure required to implement the project. In this way, higher ranking is given to the projects that result in a "bigger bang for the buck". As stated, this is a highly subjective ranking criterion, especially when it compares the relative values of unlike project benefits (e.g. comparison of environmental enhancement benefits to flood control benefits). A low ranking indicates a large expenditure with relatively small perceived benefit. A high ranking indicates a great benefit, or multiple benefits, for a relatively small expenditure.

Implementability. Implementability as a ranking criterion is an assessment of the relative degree of difficulty to construct an individual project. It is a cumulative measurement of factors such as land purchase or easement requirements, environmental permitting requirements, impacts during construction, long-term maintenance and operation requirements, relative ease of construction, and political issues. A low ranking would be assigned to projects that would have a high degree of difficulty related to any or all of these issues. A high ranking would be assigned to a project with no implementation concerns.

Public Acceptance. The assessment of the relative degree of public acceptance of an individual project is, again, a subjective evaluation that speculates how the project might be perceived by the public. A low ranking would indicate a project that would be regarded negatively by the general public, highly controversial, encounter a concerted level of resistance, and be high profile. A high ranking for an individual project would indicate it to be received with universal public support.

While each of the listed ranking criteria is an important factor when evaluating the individual watershed management projects, it is not essential that each should have an equal weighting in the evaluation matrix. For that reason, weighting factors were assigned to each, ranging from 1 to 5, to establish the relative importance of individual ranking criteria. The following is a list of the weighting factors used:

Ranking Criterion	Weighting Factor
Flood Control Benefits	5
Ecological Benefits	2
Water Quality Benefits	3
Recreational and Educational Benefits	2
Relative Benefits to Cost	5
Implementability	3
Public Acceptance	3

The prioritization ranking evaluation matrix for the proposed Alafia River Watershed Management Master Plan flood control projects is presented in Table 15.3.1-1. It is noted that this ranking matrix evolved over time, with input from the participating team members as to both relative weighting factors and the individual project rankings. There is an additional criterion that is not listed in this table that is labeled as "project precedence". While this is not a ranking criterion per se, it is an essential consideration in the development of the master plan prioritization schedule. This criterion acknowledges that in some cases there may be projects that are required to be constructed prior to the one being considered. Reasons for this occurrence could be that an upstream flood control project may result in adverse impacts in downstream reaches if other master plan elements are not constructed first. Also, an individual project may be ineffective or have its intended function impeded unless other project(s) are in place.

It must be kept in mind that the ranking process is a very subjective evaluation that is oriented towards personal values. It is, however, a valuable tool for screening projects and grouping them into relative priority classes. It is apparent through examination of Table 15.3.1-1 that those projects that serve multiple purposes rank the highest when compared to those with singular objectives and benefits.

An important consideration in derivation of a recommended prioritization plan was the status of current projects in the County's existing capital improvement projects plan (CIP). The County provided information on projects in the Alafia River Watershed that are currently in some stage of funding, evaluation, design, and/or construction. This listing is summarized in Table 15.3.1-2. It is noted that a number of the projects included in this table have been completed within the past five years. These projects are already included within the watershed model formulation as an existing condition and are noted in Table 15.3.1-2. In addition, Parsons has analyzed a number of the projects listed in the County's CIP as alternatives for the development of this Alafia River Watershed Management Plan. A cross reference is noted in the table for such instances.

The recommended prioritization plan for the proposed Alafia River Watershed Management flood control capital improvement projects is presented in Table 15.3.1-3. This table presents in an ordered ranking the set of preferred flood control projects, complete with descriptions, estimated capital costs, and composite prioritization ranking scores. The order of ranking does not imply a rigorous preferred order of implementation, since many of these projects received similar ranking scores. Other factors such as available funding, land purchase requirements, permitting requirements, and socio-political issues will influence such decisions. In addition, a number of the projects, as indicated in Table 15.3.1-3, are already included in the County's current capital improvement plan, as previously discussed. Because these projects are already in some stage of funding, evaluation, design, and/or construction, they may have received a higher ranking.

TABLE 15.3.1-1
ALAFIA RIVER WATERSHED MANAGEMENT MASTER PLAN
FLOOD CONTROL PROJECTS RANKING MATRIX

			RANKING CRITERIA							
PROJECT NO.	PROJECT DESCRIPTION		FLOOD CONTROL BENEFITS	ECOLOGICAL BENEFITS	WATER QUALITY BENEFITS	RECREATION / EDUCATION BENEFITS	RELATIVE BENEFIT / COST	ABILITY TO IMPLEMENT	PUBLIC ACCEPTANCE	WEIGHTED AVG. RANKING SCORE
		WEIGHTING FACTOR	**5**	**2**	**3**	**2**	**5**	**3**	**3**	
Buckhorn Creek Subwatershed										
BUCK-1 & BUCK-2	Barkfield Street and Huntington Street Drainage Improvements		10	2	8	1	8	7	9	7.3
BUCK-3	Craft Road Ditch Culvert Replacements and Stormwater Detention Facility		7	8	8	8	5	7	9	7.1
BUCK-4	Bloomingdale West Pond Outfall Retrofits		6	4	6	1	7	10	10	6.7
BUCK-5	Lithia Oaks Pond Outfall Retrofit		7	4	6	1	8	8	9	6.7
BUCK-6	Buckhorn Creek Stormwater Detention Pond and Wetland Restoration/Enhancement		8	8	8	8	4	6	7	6.7
Bell Creek Subwatershed										
BELL-1	Hobson Simmons Road Maintenance		8	2	3	1	8	9	9	6.5
Turkey Creek Subwatershed										
TC-1**	CSX RR and Mulrennan Road Drainage Improvements		NA	NA	NA	NA	NA	NA	NA	NA
TC-2	Mud Lake Road Drainage Improvements		7	1	1	1	2	7	8	4.2
TC-3	Bugg Road Drainage Improvements		7	1	1	1	2	7	8	4.2
TC-4	Colson Road Secondary Drainage System Improvements		7	2	2	1	6	9	7	5.4
TC-5	Jerry Smith Road Secondary Drainage System Maintenance		9	2	2	1	8	9	10	6.7
TC-6	Dover Road / S.R. 60 Drainage Improvements		8	5	5	1	6	9	9	6.6
English Creek Subwatershed										
ENG-1	Futch Road Drainage Improvements		10	2	2	1	8	8	9	6.7
ENG-2*	Joe King Road Secondary Drainage System Improvements		7	2	2	1	8	7	8	5.7
ENG-3*	Jim Johnson Loop Drainage Improvements		8	2	2	1	7	6	8	5.6

* Hillsborough County CIP
** Hillsborough County Completed CIP

TABLE 15.3.1-1
ALAFIA RIVER WATERSHED MANAGEMENT MASTER PLAN
FLOOD CONTROL PROJECTS RANKING MATRIX

			RANKING CRITERIA							
PROJECT NO.	PROJECT DESCRIPTION		FLOOD CONTROL BENEFITS	ECOLOGICAL BENEFITS	WATER QUALITY BENEFITS	RECREATION / EDUCATION BENEFITS	RELATIVE BENEFIT / COST	ABILITY TO IMPLEMENT	PUBLIC ACCEPTANCE	WEIGHTED AVG. RANKING SCORE
		WEIGHTING FACTOR	**5**	**2**	**3**	**2**	**5**	**3**	**3**	
ENG-4	South Wiggins Road Drainage Improvements		8	5	4	1	8	6	8	6.3
South Prong Alafia River Subwatershed										
S_PRONG-1	George Smith Road and Lithia Pinecrest Road Maintenance		7	5	3	1	6	5	7	5.3
S_PRONG-2	East Keysville Road Bridge Span Maintenance		6	1	1	1	9	10	10	6.2
S_PRONG-3	Wendel Avenue Drainage Improvements		7	1	1	1	5	7	8	4.9
Alafia River Main Stem Subwatershed										
AR-1	Cummins Road Drainage Improvements		9	1	1	1	7	7	8	5.7
AR-2	Greenhills Drive Drainage Improvements		10	3	3	1	8	7	9	6.7
AR-3	River Drive and Coconut Cove Place Floodprone Property Acquisition		10	9	5	9	7	5	5	7.2
AR-4	Providence Road Drainage Improvements		10	2	2	1	9	8	10	7.0
AR-5	Stearns Creek Drainage Improvements		10	8	9	7	7	6	8	8.0
AR-6*	Whitlock Place and Herndon Street Flooding Relief		10	8	4	3	6	7	9	7.0
AR-7*	Dee Circle and Alafia Ridge Road Drainage Improvements		10	8	8	3	7	8	9	7.9
AR-8	Revels Road Secondary Drainage Improvements		7	1	1	1	8	9	8	5.8
AR-9	Magnolia Street Local Drainage Improvements and Bank Protection		6	1	1	1	6	8	9	5.1
AR-10*	Ivy Estates/Watson Road Drainage Improvements		10	2	2	3	9	9	10	7.3
AR-11	Riverglen Subdivision Detention Pond Outfall Improvements		8	2	4	1	9	9	9	6.8

* Hillsborough County CIP
** Hillsborough County Completed CIP

Table 15.3.1-2
ALAFIA RIVER WATERSHED MANAGEMENT MASTER PLAN
HILLSBOROUGH COUNTY CAPITAL IMPROVEMENT PROJECTS

CIP #	Location	Description	Status	Modeled	Alafia River WMP Project #
40021	Alafia Ridge Road	Construct an outfall system to convey stormwater north from Dee Circle through pipes or ditches.	Anticipated NTP - June 2003		AR - 7
47075	Dee Circle	Construct a positive outfall for existing retention system in Shamblin Estates Subdivision off McMullen Loop. Combined with CIP 40021.	Anticipated NTP - December 2002		AR - 7
47104	Golf Heights Circle	Construct a pump station at the retention pond on Golf Heights Circle. Tie into the existing storm sewer going west on Lithia Pinecrest Road.	Completed in October 2000	Yes	
47126	Jim Johnson Road	Construct 275 L.F. of open ditch between Jim Johnson Road and Jim Johnson Loop. Construct cross drain at Jim Johnson Loop.	To be complete January 2002		ENG - 3
47158	Leonard Avenue	Construct a retention pond and install a cross drain between two ditch bottom inlets while providing positive outfall for the system.	Retired Project - 03/28/01		
47160	Lithia Ridge Subdivision	Construct approximately 1600 L.F. of underdrain.	To be complete March 2002		
47177	Riverview Drive @ I-75 (Martinez easement)	Construct new control structure in borrow pit. Install box culvert under Riverview Drive and construct 600' of pipe to the pit.	Completed in March 2000	Yes	
47191	Mulrennan Road	Construct a conveyance system to drain the ponding stormwater from the NW corner of Mulrennan Road and the CSX RR tracks to a positive outfall.	Completed in December 2001		TC - 1
47229	Riverview Drive	Reconstruct drainage system east of Dean Street including reshaping ditches and replacing culverts.	Retired Project - 02/06/01		
47246	Shadow Run Blvd	Replace/install underdrain, replace deteriorated storm sewer lines and curb inlets, rebuild portions of damaged roads.	Retired Project - 4/24/01		
47293	Valrico Road / State Road 60	Construct a new detention pond and extend the current pump station force main to connect with the new pond. Evaluate the existing pump for compatibility.	To be completed November 2002	Yes	
47296	Villa Drive / Durant Road	Construct a cross drain under Villa Drive at Durant Road. Reconstruct the roadside ditches to increase system capacity.	Completed in July 2000		
47299	Watson Road / Bloomingdale Drive	Excavate Ivy Estates percolation pond on Watson Road and provide positive outfall for the system.	Conceptual design phase (waiting on 30% plans)		AR - 10
47306	Willow Shores	Increase capacity of local stormwater conveyance system by providing pipes, drainage ditches and drainage structures of adequate size.	To be completed December 2002		

Table 15.3.1-2
ALAFIA RIVER WATERSHED MANAGEMENT MASTER PLAN
HILLSBOROUGH COUNTY CAPITAL IMPROVEMENT PROJECTS

CIP #	Location	Description	Status	Modeled	Alafia River WMP Project #
47314	Bobcat Trail / Summerall Road	Design and construct a cross drain under Bobcat Trail.	Anticipated NTP - April 2002		
47321	Guiles Road	Design and construct an upgraded storm sewer system.	Completed in March 2001	Yes	
47322	Hollington Oaks	Design and construct an improved outfall for a county maintained pond.	Completed in March 2001		
49243	Park Drive	Acquire easement and construct pipeline and outfall at Park Drive.	Completed in June 2000		
49246	Cambron Road	Construct underdrain to control high groundwater conditions.	Completed in February 2001		
49248	Bloomingdale Section "F"	Construct underdrain system.	Completed in February 2000		
49257	Braves Court / Tomahawk Trail	Construct underdrain to control high groundwater condition.	Completed in February 2000		
49263	Summitview Drive	Reconstruct obsolete storm sewer system to include pipes, manholes and end walls.	Completed in January 1999		
49276	Lake Hills Drive	Replace / improve culverts and outfall structure.	Anticipated NTP - March 2003		
49277	Donnymoore Drive	Reconstruct obsolete storm sewer system to include pipes, inlets, manholes, endwalls, etc., and associated site restoration.	Retired - 10/14/99		
49288	Gibsonton on the Bay	Overall stormwater drainage improvements including regrading ditches, replacing driveway culverts and installing CDS units.	To be completed February 2003		
TBA	Joe King Road	Improve 1500 L.F. of ditch/swale drainage system along Joe King Road including driveway culverts. Replace cross drain with a larger RCP.	Conceptual design phase		ENG - 2
TBA	Whitlock Place	Improve percolation pond and construct a pump station to pump water down Durant Road east by force main to Turkey Creek.	Conceptual design phase		AR - 6

Table 15.3.1-3
Alafia River Watershed Management Plan
Flood Control Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
AR-5 *Stearns Creek Drainage Improvements*	Widespread flooding on Stearns Road, Hillgrove Road and properties north of Stearns Road is indicated from modeling analysis. Many local residents and the Hillsborough County Service Unit have confirmed this longstanding flooding problem. During heavy rainfall events the 36-inch CMP constriction in the Stearns Creek system causes water to back-up over Hillgrove Road and sheet down Stearns Road as well as through properties to the north. This excess floodwater causes a large closed depression north of Stearns Road to flood out neighboring homes.	The preferred alternative solution is to construct a new detention facility and improve existing detention facilities in the area. The new detention facility would occupy six acres northwest of the Lithia Pinecrest Road/Stearns Road intersection, and the pond improvements involve expanding and combining the existing three-pond system, located east of Lithia Pinecrest Road and south of Stearns Road, into a 20-acre pond. Additionally, 1200 LF of 54" RCP would be constructed along Stearns Road to a newly constructed open ditch that would convey water south to the expanded 20-acre pond. This alternative would keep the existing 36" CMP in service. Also, a pump station would be installed to keep the depression north of Stearns Road drawn down.	$2,968,700	8.0	1
AR-7* *Dee Circle and Alafia Ridge Road Drainage Improvements*	Extensive flooding of Dee Circle and Alafia Ridge Road has been documented by Hillsborough County. The south retention pond on Dee Circle floods roads and properties as it is undersized and has no outfall. The north pond (ditch) has an undersized outfall pipe that discharges directly onto Alafia Ridge Road. This outflow, along with road drainage, floods the road during heavy rainfall events.	The preferred alternative solution is to purchase property adjacent to the south pond and expand the pond. An equalizer pipe giving the south pond a positive outfall would then connect this pond to the north pond (ditch). The north pond and it's outfall would be improved and would discharge into a newly constructed open ditch drainage system along Alafia Ridge Road that would outfall to a wetland to the north.	$201,409	7.9	2
BUCK-1/BUCK-2 *Barkfield Street and Huntington Street Drainage Improvements*	Barkfield Street experiences chronic flooding up to 3.0 feet deep in the street due to inadequate outfall capacity. The existing outfall to the Tanglewood Ditch is constrained by the hydraulic inefficiency of this ditch. Huntington Street is flooded by the backwater conditions in Tributary D created by an inadequately sized downstream private drive crossing.	Sever the existing storm sewer connection to the Tanglewood Ditch and construct a new 32"x49" ERCP outfall into Huntington Lake. Replace the existing 12" CMP outfall for Huntington Lake with a new 19" x 30" ERCP and modified FDOT Type D inlet control structure to fully optimize the stormwater detention and treatment capacity of this lake. Replace existing 27" x 43" CMPA culvert at private drive with 34" x 53" ERCP. Project will require purchase of drainage easements from local residents to construct the new outfalls. Environmental permitting should be fairly simple.	$74,500	7.3	3

* Hillsborough County CIP

** Hillsborough County Completed CIP

Table 15.3.1-3
Alafia River Watershed Management Plan
Flood Control Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
AR-10* *Ivy Estates/ Watson Road Drainage Improvements*	A section of Watson Road, south of the entrance to Ivy Estates Subdivision, is prone to severe flooding. This section of Watson Road was constructed through a natural depressional area with no surficial drainage outfall. A stormwater pond for Ivy Estates was constructed east of Watson Road in part of the natural depressional area.	The flooding on Watson Road could be remedied by elevating the crown of the road by approximately 30", to an elevation of 33.0 feet. At this elevation, the roadway would remain dry during a 25-year flood and would also be passable (with less than 6" of flooding) during a 100-year flood. An optional 500 gpm pump could be installed that would draw the pond down to normal levels within about 5 days after a major flood. The discharge would be to Buckhorn Creek via a new 6" PVC	$349,600	7.3	4
AR-3 *River Drive and Coconut Cove Place Floodprone Property Acquisition*	Approximately fifty private parcels of land lie within the 25-year floodplain of the Alafia River at this site. Extensive flooding will occur on River Drive, Coconut Cove Place and Squirrel Run Way. Current modeling analyses indicates these properties to be inundated by 1-7 feet of floodwaters during the 25-year storm. Although many of the homes are on stilts, the streets to the homes will be underwater and access to and from the homes will be impossible.	The preferred alternative solution is for the County to purchase the selected properties that are within the 25-year floodplain and relocate the residents. Any alternative to prevent this flooding would not be feasible or permitable. The purchase of these parcels would also promote a contiguous riparian corridor for migration of native species down the Alafia River as existing public lands are adjacent.	$3,069,710	7.2	5
BUCK-3 *Craft Road Ditch Culvert Replacements and Stormwater Detention Facility*	Excessive flooding conditions exist along the Craft Road Ditch system from Craft Road to Bryan Road. Although the County road crossings meet the 10-year road flooding level of service criterion the New Methodist Church of Brandon on Bryan Road will experience structural flooding during this and possibly smaller storm events.	Replacement of the Craft Road, Church Road and Bryan Road culverts is recommended to achieve a full 25-year flooding level of service along this reach of the channel. In addition, a 3.4-acre stormwater detention pond located on vacant land east of the Southpointe subdivision is proposed to attenuate the downstream peak flows.	$1,184,600	7.1	6

* Hillsborough County CIP

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Table 15.3.1-3
Alafia River Watershed Management Plan
Flood Control Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
AR-4 *Providence Road Drainage Improvements*	During significant rainfall events, Crescent Lake Drive and Providence Road, between Crescent Lake Drive and Watson Road, are prone to flooding. The flooding is due to inadequate conveyance capacity within the Providence Road/Crescent Lake Drive roadside ditches. The existing 18" and 24" culverts within the ditches are undersized.	Replacing all of the undersized culverts within the Crescent Lake Drive/Providence Road conveyance system with 48" RCP culverts (or equivalent) would reduce 25-year peak flood levels to below the crowns of these roads. By also upsizing the culverts under Mathers Lane and Magnolia Drive (a.k.a. Alafia Drive), flood levels would be reduced through the downstream mobile home park. Minor re-shaping of the roadside and outfall ditches would also be necessary to accommodate the larger culverts. To accommodate the improvements, a 10'-15' drainage easement would be required from the properties fronting Providence Road and Crescent Lake Drive. In addition, a 40' drainage easement over the existing outfall ditch between Crescent Lake Road and the Alafia River is recommended.	$526,100	7.0	7
AR-6* *Whitlock Place and Herndon Street Flooding Relief*	Severe street and house flooding is predicted for the north end of Whitlock Place and Herndon Street due to an undersized retention pond. The Hillsborough County Service Unit and local residents have confirmed this flooding problem. The pond was constructed at the lowest point in a large closed basin and has no positive outfall. The 25-year flood elevation of 52.43' will inundate both streets and structures, which are vertically located at 48 feet and 51 feet, respectively.	The preferred alternative solution is for the County to create additional storage by constructing a 9-acre detention pond on the property northwest of Whitlock Place. The new pond would be connected to the existing one by an equalizer pipe through the existing drainage easement between the ponds. The new pond would have enough storage to achieve 10-year LOS protection for the road and 25-year LOS protection for the homes.	$813,998	7.0	8
AR-11 *Riverglen Subdivision Detention Pond Outfall Improvements*	Improper function of the outfall for a Riverglen detention pond on the corner of McMullen Rd. and McMullen Loop causes the pond to overtop the bank and flood across McMullen Loop. The water also causes flooding down Valrie Lane as well as exacerbating the flooding on Alafia Ridge Road, as witnessed during recent storm events.	Hillsborough County staff has referred this matter to County Enforcement to take action against the owner and Engineer of record to correct what is perceived to be a design or construction problem of the pond outfall.	$0	6.8	9

* Hillsborough County CIP

** Hillsborough County Completed CIP

Table 15.3.1-3
Alafia River Watershed Management Plan
Flood Control Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
BUCK-5 *Lithia Oaks Pond Outfall Retrofit*	The Lithia Oaks Subdivision detention pond that serves as the primary storage facility for this residential subdivision does not have a functional outfall structure. The pond does not appear to receive any maintenance and the outfall consists of an 18" CMP pipe that is collapsed and silted. Function is impaired such that flooding problems could arise if a significant storm event was to occur, and it is possible that the pond bank has been breached.	It is recommended that the existing outfall structure for the Lithia Oaks pond be replaced by a 24" RCP with a modified FDOT inlet structure that will provide enhanced flood control and stormwater treatment functions over the existing structure.	$7,300	6.7	10
BUCK-4 *Bloomingdale West Pond Outfall Retrofits*	The Bloomingdale West Subdivision has two stormwater detention ponds that serve as the primary storage facilities for this residential subdivision. The ponds do not appear to receive any maintenance and the outfall structures are overgrown and function is impaired such that flooding problems could arise if a significant storm event were to occur.	The entire subdivision drainage system was constructed of corrugated metal pipe, which is corroded and likely in need of repair in the near future. It is recommended that the existing outfall structures for the Canoga Park and the Bloomingdale West ponds be replaced with modified FDOT inlet structures that will provide enhanced flood control and stormwater treatment function over the existing structures.	$9,800	6.7	11
BUCK-6 *Buckhorn Creek Stormwater Detention Pond and Wetland Restoration/Enhancement*	Buckhorn Creek traverses a set of large tracts between Holland Road and the Bloomingdale Plaza shopping center south of Bloomingdale Avenue. Mostly unoccupied, this is the last remaining unencroached part of the natural floodplain of the creek upstream of the Bloomingdale Avenue bridge and portions of the tracts are impacted wetlands. The creek is in an unmaintained state, and excessive channel vegetation creates a hydraulic impediment. Downstream from this area, the creek passes through residential developments with low street grades that barely meet a 10-year level of service.	This area provides an opportunity to preserve the natural floodplain and restore wetland functions while providing both flood control and stormwater treatment benefits. It is recommended that all or portions of five land parcels be purchased to construct a 12.0-acre on-line stormwater detention pond. As designed, the facility will reduce the downstream peak flows by approximately 15% and lower the 25-year flood elevation by 0.6 feet at Van Gogh Circle.	$1,760,400	6.7	12
TC-5 *Jerry Smith Road Secondary Drainage System Maintenance*	The Hillsborough County East Service Unit staff stated that localized flooding occurs along Jerry Smith Road between Endeavor Ave. and O' Griffin Road. This secondary drainage system is not included in the watershed hydraulic / hydrologic model. Upon field investigation, it is evident that the cross culvert is completely clogged with silt/debris, such that no positive drainage outfall exists.	The recommendation is to clear the cross culvert of the accumulated silt/debris. The downstream ditch should be graded such that a positive drainage outfall exists. The purchase of a drainage easement may be required. Routine maintenance should be performed in this system. In a maintained state it is expected that the drainage system will attain the required 25-year level of service.	$4,900	6.7	13

* Hillsborough County CIP

** Hillsborough County Completed CIP

Table 15.3.1-3
Alafia River Watershed Management Plan
Flood Control Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
ENG-1 *Futch Road Drainage Improvements*	Residents along the south side of Futch Road experience structure flooding during heavy storm events due to runoff from the north. The north ditch primarily outfalls to the problem area near the east end of the ditch. The west end of the ditch at English Creek has a set of twin 12" CMPs as a driveway culvert, restricting flow to the creek during heavy rain events.	Based on the information available, the recommended alternative solution is to clear the two driveway culverts at the east end of the north ditch of sediment and debris. The 12" pipes at the west end of the ditch, just before English Creek should be replaced with a larger pipe. The ditch may need to be re-graded to drain toward the west end of the ditch, approximately 450 feet. A detailed survey and analysis of this secondary system will be required to ensure proper project design and implementation.	$9,230	6.7	14
AR-2 *Greenhills Drive Drainage Improvements*	More than one foot of flooding over Greenhills Drive is predicted for the 25-year storm event. A permitted stormwater pond for the Greenhills subdivision exists; however, this pond, which is a sinkhole, is grossly undersized. Runoff from the west portion of Buckhorn Springs Golf & Country Club as well as part of the neighborhood to the north drains to this pond. A pump station has been installed in recent years to relieve the flooding, but has little effect during the 25-year storm event.	The preferred alternative solution is to purchase property to the south where another large sinkhole pond exists. This pond has enough available storage to relieve flooding in the area. Eighteen-inch RCP would be installed from a small pond to the south of Greenhills Drive to the newly purchased pond property. This pipe, along with the existing (currently blocked) pipe under Greenhills Drive, will equalize flood elevations in the ponds without flooding streets or homes.	$80,760	6.7	15
TC-6 *Dover Road/ S.R. 60 Drainage Improvements*	Dover Road experiences frequent road flooding with the hydrologic and hydraulic model predicting a depth of 0.54 feet, for a 25-year event. Tailwater conditions dominate at this locale and are caused by constriction or blockage of structures at SR 60 and downstream through the Sydney Mine. These structures are completely submerged; therefore, inspection to determine the source of hydraulic impediments is not possible without dewatering the area.	Further information concerning the drainage system and structures needs to be determined, including pipe inverts and sizes as well as possible blockages. This will require a de-watering operation in the vicinity of the structures. An informed and intelligent course of action can be then implemented to lower upstream water elevations (Dover Road tailwater conditions) and reduce flooding at Dover Road.	$51,300	6.6	16

* Hillsborough County CIP

** Hillsborough County Completed CIP

Table 15.3.1-3
Alafia River Watershed Management Plan
Flood Control Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
Bell 1 *Hobson Simmons Road Maintenance*	The Hillsborough County South Service Unit staff stated that flooding occurs along Hobson Simmons Road. Two cross-culverts, one to the south and one to the north, drain this ditch. Upon field investigation, it is evident that the roadside ditch is extremely overgrown with vegetation. Additionally, the southern cross culvert has a restricted conveyance capacity due to accumulation of silt and debris. The culvert appears to be a 29" x 45" ERCP; however, only a 10" x 45" opening was available on the upstream side of the structure to convey floodwater to the west under Hobson Simmons Road. The northern cross culvert also has a small amount of accumulated silt.	The roadside ditch, including the structure inlets and outlets, should be cleared of excessive vegetation. Both cross culverts should be cleared of the accumulated silt/debris and the outfall ditches should be graded such that a positive drainage outfall exists. Routine maintenance should be performed in this roadside ditch system. In a maintained state it is expected that the drainage system will attain the required 25-year flooding level of service.	$25,700	6.5	17
ENG-4 *South Wiggins Road Drainage Improvements*	Extensive yard flooding upstream of the box culvert on S. Wiggins Road has become an issue over the past few years. Channel restrictions along the downstream channel have been identified as the cause. Access to site is denied to ascertain specific cause.	Access to the site is required. Regulatory agencies should inspect the unnamed tributary. Unpermitted channel obstructions and excessive vegetation should be removed.	$41,970	6.3	18
S_PRONG-2 *East Keysville Road Bridge Span Maintenance*	The hydraulic / hydrologic model indicated excessive flooding of Keysville Road at this location for the 25-year storm event. The predicted depth of flooding on East Keysville Road is 0.55 feet. The flooding is caused by the restricted conveyance capacity of the bridge opening due to sediment accumulation.	Clearing the bridge opening of the accumulated silt will increase the conveyance capacity of the drainage structure. It is estimated that approximately 150 cubic yards (cy) of silt will need to be excavated to restore the bridge to its initial design capacity. This would yield an effective cross sectional area of approximately 161 square feet (sf) and reduce the peak flood elevation by 0.75 feet, thus achieving an acceptable level of service.	$3,200	6.2	19
AR-8 *Revels Road Secondary Drainage Improvements*	County residents at the first Hillsborough County public meeting reported street and property flooding at the Revels Road turn. Parsons field investigation confirmed the flood reports and determined the floodwaters to be sheeting over the road from the south due to a poorly maintained and insufficient drainage system.	The preferred alternative solution is to improve the existing drainage system by regrading ditches and replacing existing culverts; additionally, the drainage system should be extended to the east along the south side of Revels Road to catch road runoff and sheeting water from the south.	$33,054	5.8	20

* Hillsborough County CIP

** Hillsborough County Completed CIP

Table 15.3.1-3
Alafia River Watershed Management Plan
Flood Control Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
AR-1 *Cummins Road Drainage Improvements*	Residents of Cummins Road have reported past flooding problems, and analyses show the road will experience 0.63 feet of flooding during the 25-year storm event. The existing 18" RCP under Cummins Road is undersized and must replaced. This constriction in the system has been exacerbated by sediment build up in the channel on both sides that has effectively raised the streambed and eliminated the channel definition as well as clogging the existing culvert.	The preferred alternative solution is to replace the existing 18" RCP with 3 - 24" x 38" ERCPs. The road will need to be raised to an elevation of 22.6' to accommodate the larger culverts and to eliminate the 25-year LOS deficiency at the road; additionally, the downstream channel must be improved to avoid sedimentation of the new structures. These improvements include grading and reshaping the channel. An easement for channel improvements must be purchased.	$116,600	5.7	21
ENG-2* *Joe King Road Secondary Drainage System Improvements*	Flooding conditions have been noted by the East Service Unit and are supported by documented incidents of roadway flooding. Joe King Road does not have a completed tertiary drainage system in place. A ditch system is intact along a portion of the road but is not continuous and does not relieve the localized flooding. The County has planned an improvement project in this area to optimize drainage within the right of way. According to county personnel, it is currently unfunded but should be funded and implemented sometime in 2005-2006.	After obtaining necessary easements, the ditch system needs to be rehabilitated and completed so that runoff can be routed to the north end of Joe King Road. This will entail approximately 1500 linear feet of ditch. Driveway culverts should be replaced or installed and should be made of reinforced concrete pipe to prevent deformation. The cross drain near the tributary should be enlarged and also constructed of reinforced concrete pipe	$31,630	5.7	22
ENG-3* *Jim Johnson Loop Drainage Improvements*	Jim Johnson Loop is a small neighborhood off of Jim Johnson Road, just east of Jap Tucker Road. The tertiary drainage system in this neighborhood is in need of repair and re-establishment. The neighborhood is generally on high ground with most of Jim Johnson Loop draining to the north. Homes directly along Jim Johnson Road drain toward the east. This area was identified by the Hillsborough County East Service Unit as having localized flooding problems.	Re-establish 275 feet of ditch from the cross drain on Jim Johnson Road to the cross drain on Jim Johnson Loop, and replace 300 feet of 24" pipe from west to east along the north side of the road as shown. The ditch and driveway culvert system along the south side of Jim Johnson Loop should be cleaned and repaired on an "as needed" basis.	$55,840	5.6	23
TC-4 *Colson Road SecondaryDrainage System Improvements*	Localized road flooding of Colson Road, east of the CSX Railroad crossing, has been reported by residents and cited by the Hillsborough County East Service Unit Staff. The topography of the area indicates this is a localized problem. Cross culverts that relieve flooding are located 675 feet to the east of the railroad but do not adequately reduce flooding at this location.	Installation of a 24" diameter reinforced concrete pipe as a cross culvert within the right of way should alleviate future road flooding. A shallow ditch system 80 feet in length which drains to this culvert along the north curve of Colson Road should also be constructed.	$8,050	5.4	24

* Hillsborough County CIP

** Hillsborough County Completed CIP

Table 15.3.1-3
Alafia River Watershed Management Plan
Flood Control Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
S_PRONG-1 *George Smith Road and Lithia Pinecrest Road Maintenance*	The Hillsborough County East Service Unit staff expressed maintenance concerns for George Smith Road. Two culvert crossings at this location are extremely silted (the northern crossing is approximately 50% silted and the southern crossing is approximately 70% silted). Service Unit staff stated that it is useless to clear the southern crossing since they have no access to clean and re-grade the upstream channel.	The County should purchase a drainage easement upstream of the southern culvert crossing. The two culvert crossings along George Smith Road, as well as the box culvert on Lithia Pinecrest Road, should be cleared of accumulated silt and debris. Additionally, the upstream and downstream channels should be re-graded such that a positive hydraulic gradient exists. Routine maintenance should be performed at these locations. In a maintained state, these structures will provide the required 25-year flooding level of service.	$24,200	5.3	25
AR-9 *Magnolia Street Local Drainage Improvements and Bank Protection*	A complaint from the first Hillsborough County public meeting reported road flooding on Magnolia Street. After heavy rainfall events a low spot in the road floods with up to six inches of water. Field investigation determined that runoff is unable to reach the culvert inlet at the flooded area. The shoulder in the right-of-way is higher than the road and the culvert inlet, impeding proper drainage. Additionally, a county-owned drainage easement is eroding away where a stormwater pipe discharges into the river. The adjacent property owner indicated several feet of bank has eroded over the past few years.	The preferred alternative solution is to clear a drainage path from the road to the culvert inlet through the higher elevation yard in the right-of-way. Also, the county should fill and repair the eroded riverbank on the county-owned drainage easement in addition with implementing erosion control measures to prevent future bank erosion.	$10,843	5.1	26
S_PRONG-3 *Wendel Ave. Drainage Improvements*	The Hillsborough County South Service Unit staff stated that residents upstream of this location experience chronic yard flooding. Houses in this area are located in low lying topographic areas comprised of poorly drained soils with high ground water levels during the rainy season. No road flooding conditions were identified here, but the existing 27" x 43" CMPA's are constrictive and contribute to the yard flooding problem.	The recommendation is to replace the existing 2 - 27" x 43" CMPA's with 3 - 29" x 45" ERCP to reduce the 25-year flood elevation by 0.48 feet on the upstream side of the culvert crossing.	$36,500	4.9	27

* Hillsborough County CIP

** Hillsborough County Completed CIP

Table 15.3.1-3
Alafia River Watershed Management Plan
Flood Control Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
TC-2 *Mud Lake Road Drainage Improvements*	Excessive road flooding, with depths of 0.54 feet for the 25-year storm, is predicted for this location by the existing conditions hydrologic & hydraulic model; also, channel sedimentation is a severe problem at this location. The combination of undersized pipes and sediment build-up aggravates flooding conditions.	The recommended alternative is to replace the twin 27" by 43" CMPs with two 3' by 7' box culvert sections and remove the sediment deposit that is artificially raising the invert of the channel. This is only a temporary solution, however, if the root cause of the sedimentation problem is not resolved.	$54,960	4.2	28
TC-3 *Bugg Road Drainage Improvements*	Unacceptable levels of localized flooding over a portion of Bugg Road is predicted by the existing conditions model. The existing culverts, two 31" by 50" corrugated metal pipes, are undersized. A fence is placed across the channel, providing a potential hazard during large storm events and acting to obstruct the channel due to debris collection.	Analysis using the existing conditions hydrologic & hydraulic model shows two 4' by 7' pre-cast box culverts have sufficient capacity for the runoff encountered in a 25-year design storm event. The existing CMPs need to be removed and replaced with the box culverts. The entrance and exit channels should be re-graded so that a positive hydraulic gradient exists. The existing fence should be re-positioned such that it does not block or hinder flow through the culvert.	$60,700	4.2	29
TC-1** *CSX RR and Mulrennan Road Drainage Improvements*	Hillsborough County East Service Unit staff stated that water ponds in the railroad ditch northwest of Mulrennan Road due to a high point in the ditch. It was suggested that this water then percolates through the railroad gravel bed whereupon it flows overland to Silver Lane where yard/house flooding occurs.	Hillsborough County currently has a project in the construction phase at this location (CIP # 47191) to eliminate ponding of water within this railroad ditch. The project consists of re-grading the ditch to a uniform slope, thus eliminating the "hump", and providing a positive drainage outfall to the SR 60 drainage system. Additionally, the County is installing fabric-formed concrete ditch pavement from Mulrennan Road for approximately 300 feet along the ditch. This concrete ditch will provide further protection for water seepage through the railroad gravel bed. Additionally, the railroad culvert at SR 60 should be cleaned and regularly maintained.	$20,900	NA	NA

* Hillsborough County CIP

** Hillsborough County Completed CIP

15.3.2 Water Quality Improvement Projects

Three criteria are used to rank the water quality improvement projects – water quality improvement benefits, ecological benefits, and implementation costs. Significant distinctions are not apparent between the different projects with regard to most other potential criteria. Permittability, ease of implementation, and flood impacts were part of the selection criteria from the onset (refer to *Site Screening Analysis*, Section 13.3.1), and there are no distinguishing independent factors between the projects with respect to these criteria. All proposed water quality projects are permittable, implementable, and cause little or no flood impacts. It is true that some projects will be more easily implemented than others, but the ease of implementation is a function of project cost and size, which are ranking factors – cost is considered directly and size is considered indirectly through estimated benefits.

Two of the water quality projects that are recommended are not included in the prioritization ranking - *Shadow Run Inlet Plugging* (Bell 3/WQ) and *Cropland Soil Retention Demonstration Project* (TC-4/WQ). These two projects are the least expensive projects, but the benefits are not as readily quantified, as are the benefits of the other nine projects. The rationale and methodology for assigning scores for each of the ranking criterion are described in the following paragraphs.

Water Quality Benefits

Project water quality benefits are assigned based on the available treatment volume at each project site. Differences in treatment efficiency will exist and future sampling (refer to Section 15.4) may sway the implementation schedule; however, for now the differentiating factor with respect to water quality improvement benefits is treatment volume.

All of the ranked projects are basically the same with respect to function (wet detention) and type (surface water treatment marshes). Prior to implementation, each project should be evaluated to select design criteria that maximize the effectiveness of each project. These design criteria would include setting control elevations and sizes such that the proper mix of bypass and treatment is achieved. None of the BMP's are sized to provide 100 percent of ideal treatment for their respective watersheds, which is also why *position in watershed* is not used as a ranking criteria – in other words, no site is positioned far enough upstream that treatment capacity will go under-utilized.

Influent qualities, an indicator of the need for treatment, will vary from one site to the next; however, these project-specific sites are positioned at a smaller scale than the water quality assessments presented in Chapter 7. Sufficient data coverage is not available to rank these particular sites with respect to the need for water quality treatment. Initially, the subwatershed assessments and loading model results were considered for incorporation into the rankings; however, use of these would require designation of a “target-parameter” since the order (best to worst) of water quality varies by constituent from one area to the next. The need for treatment exists

watershed-wide and the tributary area and land use was one of the primary site selection criteria. For these reasons no additional score, for water quality benefits, was assigned based on the location of the respective projects.

Projects were assigned a maximum score of ten (10) for water quality benefits. This maximum score was adjusted downward for each project based on the ratio of the project's treatment volume to the largest (FISH-1/WQ) treatment volume. Water quality improvement benefit scores are weighted by a factor of five (5) - the highest weighting factor used in the rankings.

Ecological Benefits

Location and size were the primary factors used in scoring the ecological benefits of the individual sites. Larger sites, of course, translate to larger habitats, and, for the most part, the proposed projects are similar with respect to plant density; therefore, size, along with location, is used to determine the ecological benefits. One site, Bell-1/WQ, was scored lower due to a lower proposed vegetation density. Sites that would add to contiguous natural areas or wildlife corridors received higher marks for location, and one site (AR–1/WQ) received additional consideration because of its location within critical foraging habitat for the white ibis. Ecological benefit scores are weighted by a factor of two (2).

Cost

Project costs vary from $120,000 to $1.8 million. The most expensive project (TC-1/WQ) was assigned a zero (0) for the cost score The cost scores are calculated by subtracting the ratio of the project cost to most expensive project from one (i.e. Cost Score =1-(Cost/Cost of Most Expensive Project)). Cost scores are weighted by a factor of four (4)

Project Rankings

The Bell Creek Pond Improvements – Site 1 project (BELL-1/WQ) is the top-ranked project due to the high degree of water quality benefits that can be provided at this site at a low cost. The Fishhawk Creek project and the other Bell Creek pond improvement project ranked high, as did ENG-2/WQ and TC-1/WQ. The prioritized list of projects is provided in Table 15.3.2-1. Additional details concerning the scoring are provided in Table 15.3.2-2.

From a strict water quality benefits to cost perspective, the cost per acre-foot of treatment ranges from around $4,000 for BELL-1/WQ to $258,000 for TC-3/WQ. The next most expensive treatment is at ENG-1/WQ, which is estimated at around $96,000 per acre-foot.

Table 15.3.2-1
Alafia River Watershed Management Plan
Water Quality Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
BELL1/WQ *Bell Creek Pond Improvements – Site 1*	Bell Creek experiences water quality impairments with respect to dissolved oxygen, phosphorous, and NO_x; in addition, high fecal coliform levels have been observed in this Alafia River tributary.	A riser structure impounds water in an existing pond at the proposed project location. This existing impoundment presents a good opportunity to provide increased water quality treatment. The primary improvement proposed for this existing pond involves replacing the riser structure with a new control structure – this new structure would be equipped with a bleed-down device to allow for detention time and recovery of a treatment volume. To further enhance water quality improvement benefits, a sump could be dredged at the inflow side of the pond. The dredged material could be placed near the outflow side to create a shallow littoral zone.	$120,192	7.7	1
FISH-1/WQ *Fishhawk Creek Surface Water Treatment Area*	Total nitrogen, NOx, and phosphorous levels are high in Fishhawk Creek as are total and fecal coliforms counts. Deeply incised channels, forested riparian areas, and rolling terrain reduce the prevalence of sites suitable for water quality treatment areas.	Proposed improvements to this site include the installation of a side-flow weir to divert water from Little Fishhawk Creek into a treatment area consisting of a sump, open water, and marshes. A bleed-down structure at the east side of the pond will allow for detention time and recovery of a treatment volume	$1,590,553	6.2	2
Bell 2/WQ *Bell Creek Pond Improvements – Site 2*	Bell Creek experiences water quality impairments with respect to dissolved oxygen, phosphorous, and NO_x; in addition, high fecal coliform levels have been observed in this Alafia River tributary.	An existing pond is present at this location. Currently, flow from the pond is controlled by the channel invert on the downstream side of the pond. Proposed improvements to this existing pond include expansion of the open water area and excavation of new upland areas for creation of shallow and deep marshes. A bypass control structure will allow high flows to bypass the treatment system thus mitigating potential impacts to flood stage. A bleed-down structure at the east side of the pond will allow for detention time and recovery of a treatment volume.	$214,405	6.2	3
ENG-2/WQ *English Creek Surface Water Treatment Area – Site 2*	English Creek is plagued by excessive coliform and nutrient concentrations. These high nutrient concentrations include both phosphorous and nitrogen – especially inorganic nitrogen.	Relatively low relief and absence of riparian forests makes this existing pasture an ideal location to provide increased water quality treatment. This site's Hillsborough County ownership further enhances the site's value as a water quality improvement area. Proposed improvements to this site include the installation of a side-flow weir to divert water from this English Creek tributary into a treatment areas consisting of a sump, open water, and marshes. A bleed-down structure at the east side of the pond will allow for detention time and recovery of a treatment volume.	$675,515	5.9	4

Table 15.3.2-1
Alafia River Watershed Management Plan
Water Quality Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
TC-1/WQ *Turkey Creek Surface Water Treatment Area-Site 1*	Nutrient levels, especially phosphorous and NOx are high in Turkey Creek; in addition, total coliform as well as fecal coliform counts are consistently high.	This improvement project consists of a diversion channel to transfer water from Turkey Creek to a treatment marsh. The diversion channel is needed so that water may be withdrawn at an upstream location with grade more compatible to the treatment area site. A bleed-down structure at the southwest corner of the pond will allow for detention time and recovery of a treatment volume	$1,774,595	5.3	5
AR-1/WQ *US Highway 301 – Park Drive Area Stormwater Retrofit*	Untreated stormwater runoff from US Highway 301 enters an Alafia River tributary at this location.	An existing depressionial area at the project site provides flood relief for a US Highway 301 outfall. This project consists of drainage modifications to route normal flows as well as the "first flush" to this area for treatment.	$118,110	4.5	6
TC-2/WQ *Turkey Creek Surface Water Treatment Area-Site 2*	Nutrient levels and the presence of fecal material are the primary water quality issues associated with the Turkey Creek Watershed. The availability of water quality data for the Little Alafia River above Medard Reservoir is very limited, and some data suggests that Medard Reservoir provides a great deal of water quality improvement benefits; however, protection of water quality in the natural segments of the Little Alafia River between Holloway Road and Medard Reservoir is needed.	This improvement project consists of a diversion channel to transfer water from the Little Alafia River to a treatment marsh. The diversion channel is needed so that water may be withdrawn at an upstream location with grade more compatible to the treatment area site. The withdrawal location was selected in order to take advantage of an existing electric transmission line corridor. A bleed-down structure at the southeast corner of the pond will allow for detention time and recovery of a treatment volume	$154,496	4.2	7
ENG-1/WQ *English Creek Surface Water Treatment Area – Site 1*	English Creek is plagued by excessive coliform and nutrient concentrations. These high nutrient concentrations include both phosphorous and nitrogen – especially inorganic nitrogen.	Relatively low relief and absence of riparian forests makes this existing pasture an ideal location to provide increased water quality treatment. Proposed improvements to this site include the installation of a side-flow weir to divert water from Howell Branch into a treatment area consisting of a sump, open water, and marshes. A bleed-down structure at the east side of the pond will allow for detention time and recovery of a treatment volume.	$722,028	3.7	8

Table 15.3.2-1
Alafia River Watershed Management Plan
Water Quality Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Score	Ranking Number
TC-3/WQ *Turkey Creek Surface Water Treatment Area-Site 3*	Nutrient levels and the presence of fecal material are the primary water quality issues associated with the Turkey Creek Watershed. The availability of water quality data for the Little Alafia River above Medard Reservoir is very limited, and some data suggests that Medard Reservoir provides a great deal of water quality improvement benefits; however, protection of water quality in the natural segments of the Little Alafia River between Holloway Road and Medard Reservoir is needed.	This low-lying, open area adjacent to a tributary of the Little Alafia River provides an excellent location to provide surface water treatment. Proposed improvements to this site include the installation of a side-flow weir to divert water from the creek into a treatment area consisting of a sump, open water, and marshes. A bleed-down structure at the southern (downstream) end of the pond will allow for detention time and recovery of a treatment volume	$1,032,085	2.9	9
Bell 3/WQ *Shadow Run Inlet Plugging*	An abandoned roadway and associated drainage system exists on this Hillsborough County ELAPP site. These site improvements were constructed for a planned expansion of the Shadow Run Subdivision. These drainage inlets are traps for organic material (leaves, etc.) that subsequently decays and contributes to pollutant loads in Bell Creek.	These inlets can be filled with sand or flowable fill.	$2,400	Not Ranked	
TC-4/WQ *Cropland Soil Retention Demonstration Project*	Improper crop management activities contribute to water quality impairments throughout the Alafia River Watershed. These impairments result from sediment laden runoff originating from croplands.	This strawberry field provides an excellent opportunity to demonstrate the effectiveness, in regards to soil retention, of proper crop management practices. Discharge from this field is free of offsite influences, and onsite observations indicate that the farm operator has attempted to implement measures aimed at soil retention.	$11,000	Not Ranked	

Table 15.3.2-2

Water Quality Project Ranking

	Project Description	Water Quality Benefit	Ecological Benefit	Cost	Weighted Avg. Ranking Score
WEIGHTING FACTOR		*5*	*2*	*4*	
BELL-1/WQ	Bell Creek Pond Improvements - Site 1	9.00	1	9.32	7.7
FISH-1/WQ	Fishhawk Creek Surface Water Treatment Area	10.00	7	1.04	6.2
BELL-2/WQ	Bell Creek Pond Improvements - Site 2	3.33	8	8.79	6.2
ENG-2/WQ	English Creek Surface Water Treatment Area - Site 2	4.00	10	6.19	5.9
TC-1/WQ	Turkey Creek Surface Water Treatment Area - Site 1	9.33	6	0.00	5.3
AR-1/WQ	US Highway 301 - Park Drive Area Stormwater Retrofit	0.50	5	9.33	4.5
TC-2/WQ	Turkey Creek Surface Water Treatment Area - Site 2	0.67	3	9.13	4.2
ENG-1/WQ	English Creek Surface Water Treatment Area - Site 1	2.50	2	5.93	3.7
TC-3/WQ	Turkey Creek Surface Water Treatment Area - Site 3	1.33	4	4.18	2.9
BELL-3/WQ	Shadow Run Inlet Plugging	Not Ranked			
TC-4/WQ	Cropland Soil Retention Demonstration Project	Not Ranked			

15.3.3 Natural Systems Enhancement Projects

The purpose of this section is to prioritize the nine proposed projects for improvements to the natural systems in the Alafia River Watershed. As discussed in Chapter 13, the nine projects include a variety of potential habitat improvements and preservation recommendations. In order to prioritize these projects, it was necessary to consider the benefits and drawbacks to be realized by the implementation of each of the projects. The benefits may include:

- Increasing habitat connectivity,
- Providing important foraging areas for wildlife,
- Restoring disturbed lands to create wildlife habitat, and
- Creating multiple uses for sites to enhance their potential value.

Drawbacks to the implementation of these projects may include:

- Difficulty in obtaining environmental permits,
- Expensive land and construction costs, and
- Lack of public interest, or public opposition.

Increasing habitat connectivity can be accomplished by preserving and/or restoring lands that will contribute to the Hillsborough County Greenways Program or to an established wildlife corridor, or by installing wildlife underpasses. Some of the proposed projects create wetlands that will provide important foraging or breeding areas for wildlife, especially for species of special concern like the white ibis, or for species of recreational or commercial importance like redfish. The habitat restoration projects will convert previously disturbed lands into wildlife habitat and water quality treatment areas. And in order to enhance the benefits of certain proposed projects, multiple uses can be recommended, such as passive use parks or science education facilities.

Several of the sites may be difficult to permit for habitat restoration due to the EPC's policy of claiming phosphate-mining pits as wetlands. The permitting will likely emphasize the water quality benefits to be realized in order to justify the wetland impacts. The lands identified for purchase are located along the river or are currently in use as crop or grazing lands. Any undeveloped land within the County is at a premium and will only increase in value over time. The construction costs for some of the projects will include a significant amount of earthwork due to the topography of the post-mined lands. And finally, some projects may be perceived as frivolous by some members of the public that are more interested in funding drainage improvements and flood control measures.

The evaluation of the proposed projects based on these factors is necessarily subjective and often a matter of unsupported personal opinion, but to date there is no viable scientific method available to establish a ranking of this type. Some choices

are obvious, such as ranking restoration sites that are already in public ownership higher than site that will require purchase due to the savings in land costs. Smaller projects with lower implementation costs like the redfish nursery or the wildlife underpass will likely reap significant benefits for the costs of construction. Other choices may not be so obvious, such as the purchase and preservation of one of the riverfront properties over another.

The benefits and drawbacks for the implementation of all nine projects were evaluated and the projects have been prioritized. Table 15.3.3-1 provides a brief description of the proposed natural systems enhancement projects with the estimated costs for implementation and the ranking as to priority. The projects that require purchasing riverfront property ranked highest due to the rapidly increasing land values. The Williams property was prioritized highest for purchasing because it is predominantly uplands, in an urbanized area, and has the potential to provide habitat for several protected species. The proposed erosion control project ranked lowest in importance for this study because the implementation for this project is underway. The cost estimate for the Balm-Boyette Scrub Habitat Restoration Project is presented as a range because of the uncertainty of topography of the site.

Table 15.3.3-1
Alafia River Watershed Management Plan
Natural Systems Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Number
AR-3/NS *Williams Property Land Acquisition and Habitat Restoration*	The white ibis (Eudocimus albus) has been listed in the state of Florida as a "species of special concern" due to the decline in breeding habitat. One of the largest breeding colonies of white ibis in North America is located at the mouth of the Alafia River. White ibis nestlings require a diet containing freshwater prey to avoid salt stress, but freshwater wetlands within the vicinity of the breeding colonies have declined. This project proposes to create freshwater wetlands within foraging distance of the breeding colony.	This site is approximately 90 acres and is located between the Alafia River north shore and Riverview Drive, east of I-75. This site consists predominantly of improved pasture with a small amount of slash pine flatwoods, and three highly disturbed wetlands. The southern boundary of the site borders on the Alafia River. This site lies within the radius of critical foraging habitat for the white ibis breeding population and there is an excellent potential for the creation of shallow foraging ponds for wading birds as well as for the restoration of upland wildlife habitat. The development of the site for wildlife habitat uses could be enhanced by creating a passive recreation area that would include an education/ interpretation facility. A boat ramp, canoe launch, picnic area, and other non-invasive facilities would also enhance the park.	$4,307,000	1
FISH-1/NS *Pringle Branch Land Acquisition and Habitat Restoration*	One of the major goals of the land acquisition programs is to create wildlife corridors which allow the uninhibited movement of wildlife throughout the country. Purchase and restoration of these parcels would result in a contiguous riparian corridor along Fishhawk Creek and its tributaries. This corridor would consist of approximately 9 miles of protected habitat, and would provide for the movement of wildlife for breeding and foraging. Water quality would be improved by the filtering of surface water runoff through the riparian forests, and by the removal of the agricultural land uses within the floodplain.	If the County were to purchase the two small parcels located between the Balm-Boyette Scrub Preserve and the West Pruitt Mitigation site, protection of the riparian habitat for Fishhawk Creek and Bell Creek would be complete. These parcels, a total of approximately 400 acres, have a combined market value of around $1,000,000, and include a fish farm, crop land, several mined pits, and improved and unimproved pasture land. Restoration would require excavating and grading the filled wetlands, filling the fish ponds, and planting with the appropriate native species.	$2,962,600	2
AR-4/NS *John Moore Road Habitat Restoration and Preservation*	The Hillsborough County Greenways Program is trying to achieve a contiguous belt of undeveloped green space from the Polk County line to the mouth of the river, called the Alafia River Greenway. The greenway will serve as a wildlife corridor connecting the eastern part of the county to Tampa Bay.	This site consists of wooded floodplain, pasture, and fish farms. It provides undeveloped shoreline along the river and if restored, would make an excellent passive park. Restoration would require the removal of nuisance vegetation, including air potato, wild grape, and other noxious vines, and planting of native understory species to reduce erosion. This parcel would significantly improve the wildlife habitat in the region by preserving a portion of the Alafia River Greenway. It would also provide important riparian habitat, and water quality benefits.	$3,004,00	3

Table 15.3.3-1
Alafia River Watershed Management Plan
Natural Systems Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Number
FISH-2/NS *Balm-Boyette Scrub Preserve Water Quality Treatment and Habitat Restoration*	The eastern side of the Balm Boyette Scrub Preserve was previously mined and the site currently appears to be a hilly, grassy pasture with scattered, deeply incised elongated ponds. Water quality in the ponds is poor, and one of the ponds is currently discharging into Pringle Branch through an eroded berm.	The County proposes to join with SWFWMD to restore a portion of the area in the interest of improving water quality and restoring habitat. The restoration project would add approximately 340 acres of wildlife habitat to the Balm-Boyette Scrub Preserve, including 160 acres of wetlands and 170 acres of uplands. The wetlands would include restored forested floodplain, open water, and freshwater marshes, and the uplands would include restored turkey oak/longleaf pine sandhill, sandpine scrub, and dry grasslands. The ponds would be graded to create littoral shelves for wildlife habitat and water quality treatment, and then connected to Pringle Creek.	$7,356,700 to $13,500,400	4
BUCK-1/NS *Buckhorn Springs Land Acquisition and Restoration*	Buckhorn Springs is one of the last undeveloped shoreline parcels on the lower reaches of the river and should be preserved. The protection and restoration of this site would create locally significant habitat on the banks of the Alafia River.	This 149 acre parcel is predominantly floodplain and second growth forested uplands, and it has approximately 3000 feet of frontage on the northern bank of the Alafia River. It also has several natural springs that flow continually. This site has a lot of potential as wildlife habitat given its location on the Alafia River, and the variety of habitats available. The site would also make an excellent passive recreation and education facility, given its location adjacent to an elementary school. The river frontage would allow the construction of a canoe/kayak launch facility, and boardwalks could meander through the floodplain with interpretative signage to describe the unusual karst geology.	$2,200,000	5
BELL-2/NS *Triple Creek Ranch Habitat Restoration*	Riparian corridors are extremely important in preserving the viability of wildlife populations. The lack of wildlife corridors can inhibit the movement of animal populations and cause the eventual decline of species due to the loss of genetic viability. The Triple Creek Ranch, combined with the Balm Boyette Scrub, Rhodine Scrub, and the Bell Creek Preserves, will provide over 7000 acres of contiguous wildlife habitat along an important tributary to the Alafia River.	The ELAP program recently added the 1100-acre Triple Creek Ranch to the list of County-owned lands. The Natural Resources Division mows the area periodically to prevent succession into nuisance hardwoods species and the resultant expensive site clearing costs. A very conceptual design has been developed for the restoration of this property, based on soils and historic aerials. Restoration of the pasture areas to pine flatwoods and hardwood hammocks would eventually reduce the maintenance required and significantly improve the wildlife habitat benefits provided in this area, especially when combined with the habitat provided by the contiguous property.	$717,700	6

Table 15.3.3-1
Alafia River Watershed Management Plan
Natural Systems Projects Prioritization Plan

HILLSBOROUGH COUNTY

Project Number/ Title	Problem Description	Proposed Project Description	Capital Cost	Ranking Number
BELL-1/NS *Balm-Boyette Scrub Wildlife Underpass*	One of the major goals of land acquisition programs is to create wildlife corridors that allow the uninhibited movement of wildlife throughout the county. Animal populations that are not allowed to intermingle and exchange genetic material may lose viability and eventually decline. Roadways can be major obstacles to animals, especially roads that intersect riparian habitat, because most migrating animals travel within the riparian corridor. Wildlife underpasses will reduce the potential for animals being killed as they cross.	The Hillsborough County Natural Resources staff has observed a substantial number of wildlife road kills on these roads and would like wildlife underpasses installed in the two roadways that intersect the Balm-Boyette Scrub. Wildlife underpasses are simply culverts or bridges that allow animals to cross under roadways and avoid traffic. Placement of the underpass will require a wildlife study to determine what wildlife would potentially use the underpass and where the wildlife typically cross the road.	$39,000	7
AR-1/NS *Redfish Nursery Expansion*	Redfish or red drum (*Sciaenops ocellatus*) are an important species to commercial and recreational fisheries as a food and sport fish. Populations have been steadily declining due to overfishing and loss of nursery habitat.	A tidally-influenced canal excavated within an electrical transmission corridor has been identified as a redfish nursery. This project proposes to expand the size of the nursery by excavating to expand the size of the canal. The implementation of this project is expected to increase the redfish population within the Alafia River and Tampa Bay.	$135,000	8
AR-2/NS *Riverview Community Center Erosion Control Demonstration*	The riverbank in the vicinity of the Riverview Community Center has been eroding significantly over the years despite the riprap and other material place on the banks. This bank erosion creates sedimentation problems downstream which affects benthic organisms and impacts fish foraging and nursery habitat.	This proposed project is in Riverview at the Riverview Community Center on Park Drive. The project was planned as a demonstration to show waterfront residents different types of erosion control and bank stabilization techniques, with additional information regarding costs and wildlife habitat benefits. The project was permitted and funded, but delayed. The implementation of this project will provide the residents in the area with options for the preservation of the shorelines and the creation of habitat on their own property.	$200,000	9

15.4 PROPOSED MONITORING PLAN

Several routine monitoring programs are in place within the Alafia River Watershed. These programs include the Hillsborough County EPC's ambient monitoring program and the USGS's flow and water quality monitoring program. These existing programs are described in more detail is Chapter 7 and summarized for their relation to the proposed monitoring plan below in Section 15.4.1, *Summary of Active Monitoring Programs*. Additionally, Tampa Bay Water Recently initiated its Hydrobiological Monitoring Program (HBMP) for the Alafia River. The station locations for these existing programs along with the locations of proposed stations are shown on Figure 15.4-1.

Because the goals for this project relate to control of pollutants associated with stormwater runoff, there are multiple sampling objectives. These include:

- ✓ Refine and complete evaluation of existing conditions,
- ✓ Address spatial or temporal gaps in existing data,
- ✓ Identify and confirm stormwater parameters of concern (POC's),
- ✓ Improve loading estimates, and
- ✓ Identify priority locations and parameters for management actions.

It is not feasible to fully meet each of these objectives due to funding considerations; therefore, Section 15.4.2, *Recommended Monitoring Programs*, is intended as a menu, more-or-less, of monitoring programs that should receive consideration. At the end of each subsection *Specific Recommendations* concerning station locations are provided. Each of the stated objectives can be, at least partially, met by implementing the proposed monitoring program at the stations listed in *Specific Recommendations*

15.4.1 Summary of Active Monitoring Programs

Routine water quality monitoring is performed by Hillsborough County EPC (EPC) at nine (9) stations and by USGS at three (3) stations in the watershed. Additionally, Tampa Bay Water recently initiated its Hydrobiological Monitoring Program (HBMP) for the Alafia River. Station locations or, in the case of the HBMP, study limits are shown on Figure 15.4-1. Current EPC and USGS routine monitoring stations are summarized in Table 15.4-1.

The EPC monitoring program provides measurements of standard hydrographic variables (temperature, pH, dissolved oxygen, specific conductance, salinity), major nutrient (nitrogen and phosphorus) forms, chlorophyll *a*, *b*, and *c*, biochemical oxygen demand (BOD_5), bacteriological indicators (total coliform, fecal coliform), and several ions and metals (e.g., Boler 1998). The USGS stations provide continuous stream discharge records as well as water quality parameters similar to the EPC program with the addition of metals. Tampa Bay Water's HBMP covers the Alafia River from its mouth up to the Lithia Springs and provides measurements of standard

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FIGURE 15.4-1
ALAFIA RIVER WATERSHED
LONG TERM WATER QUALITY
MONITORING STATIONS

Legend

Water Quality Stations

- RECOMMENDED MONITORING STATION
- HILLSBOROUGH COUNTY EPC
- USGS
- Tampa Bay Water HBMP

Conveyance Network

- Creek
- Main River Channel

Major Roads

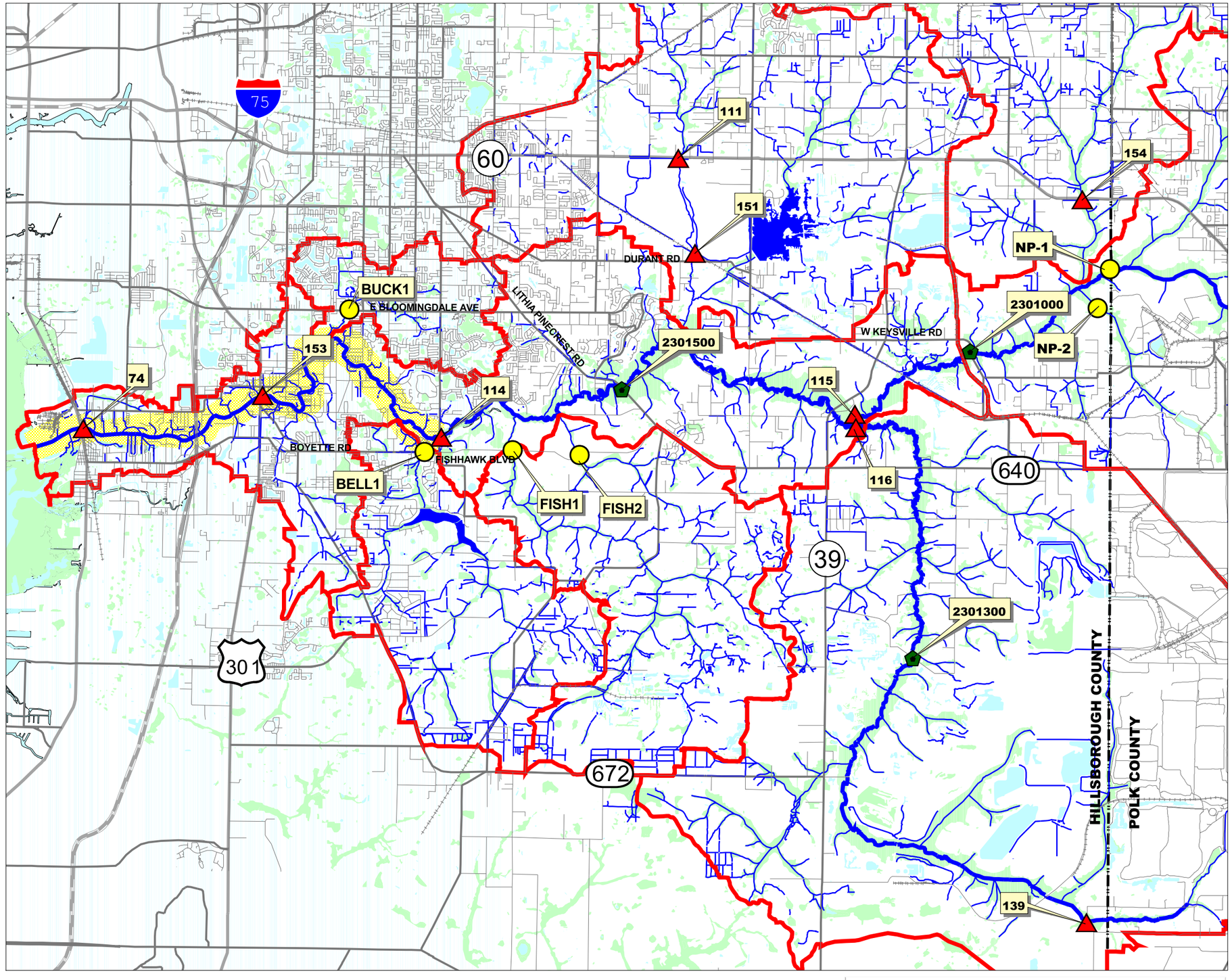
- Primary road with limited access
- Primary road
- Secondary and connecting road
- Subwatershed Boundary
- County Boundary
- Wetlands
- Water

2 0 2 Miles

Scale: 1" = 2 miles

HILLSBOROUGH COUNTY
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hydrographic variables (temperature, pH, dissolved oxygen, specific conductance, salinity), chlorophyll *a*, biochemical oxygen demand (BOD_5), organic carbon, as well as benthos, plankton, fish, birds, and vegetation.

Table 15.4-1
Alafia River Watershed Water Quality Monitoring Stations

Agency	Station	Type	Location	Basin	Period	Freq	Parameters
TBW	Various	-	Lower Alafia River	Alafia	<2 years		
EPC	74	Estuarine	Alafia River at U.S. 41	Alafia	> 10 years	monthly	WQ1
EPC	114	Freshwater	Alafia River at Bell Shoals Road	Alafia	> 10 years	monthly	WQ1
EPC	153	Transitional	Alafia River at U.S. 301	Alafia	< 3 years	monthly	WQ1
USGS	02301500	Freshwater	Alafia River At Lithia Fla	Alafia	> 10 years	monthly	WQ2
EPC	154	Freshwater	English Creek at S.R. 60	English	< 3 years	monthly	WQ1
EPC	115	Freshwater	North Prong Upstream of Confluence	North Prong	> 10 years	monthly	WQ1+metals
USGS	02301000	Freshwater	North Prong Near Lithia	North Prong	> 10 years	monthly	WQ2
EPC	116	Freshwater	South Prong Upstream of Confluence	South Prong	> 10 years	monthly	WQ1
EPC	139	Freshwater	South Prong At Bethlehem Rd.	South Prong	> 10 years	monthly	WQ1
USGS	02301300	Freshwater	South Prong Near Lithia Fla	South Prong	> 10 years	monthly	WQ2
EPC	111	Freshwater	Turkey Creek at S.R. 60	Turkey Creek	> 10 years	monthly	WQ1
EPC	151	Freshwater	Turkey Creek At Durant Road	Turkey Creek	> 10 years	monthly	WQ1

Note: WQ1 – Color, turb, secchi, temp., cond, pH, DO, BOD5, sal, TKN, NH3, NO3/NO2, org-N, total-N, ortho-P, total-P, Ca, Mg, K, ChlA, ChlB, ChlC, ChlT, coliforms; no organic chemicals.
WQ2 – Color, turb, secchi, temp., cond, pH, DO, NH3, NO3/NO2, org-N, total-N, ortho-P, total-P, Ca, Mg, K; trace metals, no organic chemicals.

15.4.2 Recommended Monitoring Programs

Nonpoint source problems are not just reflected in the water chemistry. Instead, nonpoint source problems are often more evident in the biology and habitat of the aquatic system. Therefore, the monitoring program should include a combination of chemical, physical, and biological components. The recommended programs described in this section include additions to the ambient monitoring program as well as new programs for wet weather sampling, macroinvertebrates sampling, and fish sampling. While each of these programs is desirable, it is understood that funding considerations will dictate which programs, and at what stations, are actually implemented.

Six new monitoring stations are proposed as shown on Figure 15.4-1. Four of these stations are proposed to provide coverage for major subwatersheds that are currently not included in existing programs, and two stations are proposed to monitor water quality status at the county line – one station in the North Prong Alafia and one station in Thirtymile Creek. These stations are identified as follows to facilitate reference in this report.

- ✓ BELL1 – Bell Creek at Boyette Road,
- ✓ BUCK1 – Buckhorn Creek at Bloomingdale Avenue,
- ✓ FISH1 – Fishhawk Creek at Fishhawk Boulevard,
- ✓ FISH2 – Little Fishhawk Creek at Fishhawk Boulevard,
- ✓ NPRONG1 – North Prong Alafia River at County Line, and
- ✓ NPRONG2 – Thirtymile Creek at County Line.

These station locations are easily accessible with the exception of NPRONG1 and NPRONG2 where access driveways will be required. Both of these sites, as well as access, are located on an approved ELAPP parcel.

15.4.2.1 Water Quality Status

Additional monitoring stations are needed to address spatial gaps in current monitoring area coverage. These would include new stations to provide coverage for Fishhawk Creek, Little Fishhawk Creek, Bell Creek, Buckhorn Creek, and Polk County inflow in the North Prong Alafia as described above. In addition to new these new stations additional physical and chemical measurements are recommended.

Measurement of flow at the time of sample collection would extend the value of the water quality data collected. The means to measure flow should be provided at each existing and new station. Flow measurements are helpful in interpreting water quality observations and essential in the calculation of pollutant loading estimates.

The most practical method of measuring the discharge is through the velocity-area method. This method requires the physical measurement of the cross-sectional area and the velocity of the flowing water. Discharge is then determined as the product of the area times the velocity. Velocity is measured by using a current meter. This is readily implemental in the wadable portions of the streams but will require greater effort at deeper locations where equipment must be deployed or a current meter must be suspended over a bridge to take the measurements. Periodic velocity measurements may also be used to establish and maintain a stage-discharge relationship at desired locations. Once the stage/discharge relationship is known, future flow measurements can be taken simply by measuring the stage. The stage-discharge relationship will, however, change over time due to shifting sediments and changes in aquatic and bank vegetation; therefore, periodic velocity measurements are needed.

Specific Flow Measurement Recommendations

- ✓ Instantaneous measurement at time of sample collection: A cross-section should be taken at these stations and a staff gauge installed. For wadable locations velocity measurements should be taken monthly (at the time of sample collection) for the first year and thereafter quarterly or whenever a flow condition not previously measured is observed. For non-wadable locations, velocity measurements should be taken by deploying equipment or taking current measurements during frequent visits over a 6-month period to establish a stage

discharge relationship. The stage-discharge relationship should be reevaluated annually. These include EPC Stations 111, 115, and 116 and new station FISH2.

✓ Continuous flow measurement: A new continuous flow measurement station is planned by USGS/SWFWMD at Bell Shoals Road to serve the needs of Tampa Bay Water's proposed surface water withdrawal. Continuous flow monitoring is also recommended at EPC Stations 139, 151 and 154 as well as new stations BUCK1, BELL1, FISH1, NPRONG1, and NPRONG2.

The continuous flow measurement stations could be outfitted with rain gauges and telemetry to aid in flood forecasting as well. This dual use will also allow for more varied funding opportunities. These real-time data could also include conductivity and pH and would be a good addition to the Hillsborough County Watershed Atlas.

As budget allows, additional analytes should be added. These analytes need-not be added on a per event basis (monthly) but, rather, could be added quarterly or bi-annually. In order, the other anaytes that should be considered are metals, pesticides, PCBs PAHs, as well as unregulated organic contaminants. Based on sediment analysis performed by EPC in the lower Alafia River, it appears that chlorinated pesticides (e.g., chlordane) may be a concern. The presence of these pesticides likely reflects historical contamination, although runoff from agricultural areas could contain pesticides not currently applied. Based on benthic analysis performed by EPC, PAHs do not appear to be a concern in this watershed. This likely reflects the lack of urbanization in most of the watershed. Data for additional toxic contaminants (e.g., PCBs) were not identified.

15.4.2.2 Wet Weather Flow

Storm event sampling should be performed to aid in loading estimates, confirm stormwater POCs, to develop watershed-specific EMCs, and to facilitate comparisons to or extrapolation from other stormwater characterization studies (e.g., nutrient form, or TSS/organics). Recommended major parameters include metals (e.g., lead and mercury), pesticides, nitrogen/phosphorous, and coliforms.

Stormwater sampling is not an element of existing sampling programs. Instead, pollutant load estimates rely on default EMC values established for each land use. This adds considerable uncertainty to loading estimates; however, stormwater sampling requires a complex, and typically expensive, sampling protocol to measure discharge and pollutant concentration. Both discharge and concentration data are needed to calculate pollutant loading.

Ideally, wet weather sampling stations would be equipped with auto-flow compositing, refrigerated samplers equipped with telemetry. These systems are expensive. There are some less expensive, albeit in some cases less accurate, methods for collecting stormwater samples. One less expensive method would be to coordinate with the USGS to run auto-flow compositing samplers from the existing

USGS equipment. These flow stations are present at three locations in the watershed and is soon to be available at the Tampa Bay Water withdrawal point at Bell Shoals Road. As an alternative, discrete samplers could be installed and then manually composited- more effort but a time-series could be analyzed if desired and direct connection to the existing monitoring equipment is not necessary.

Other less expensive wet weather sampling techniques include grab sampling and alternative flow compositing equipment. Grab samples would provide data of diminished value as opposed to flow-weighted composites, but will provide a means to make comparisons of base and storm event flow. If will and manpower requirements are available, these grab samples can be collected throughout the discharge event and hand-composited garnering flow information from stage measurements for which stage-discharge relationships have been established. Likewise, while not a true flow weighted composite, relatively inexpensive stormwater samplers are available that collect incremental sample volumes into a composite bottle based on user-defined stage/volume sample relationships – the result is an approximate flow-weighted composite.

Specific Wet Weather Sampling Recommendations

Wet weather sampling is recommended at EPC Stations 139, 151 and 154 as well as new stations BUCK1, BELL1, FISH1, NPRONG1 and NPRONG2. The new USGS/SWFWMD should also be included. If only three stations are installed then EPC Station 139, NPRONG1, and the new USGS/SWFWMD station are the most critical. If some of the more approximate, inexpensive stormwater sampling techniques are employed at the other stations then the continuous flow measurement requirement, described above in Section 15.4.2.2, may be removed.

15.4.2.3 Source Tracking

In addition to ambient and storm event flow monitoring, a concentrated monitoring effort aimed at source tracking is recommended. Two primary elements are proposed.

1. A general source tracking program directed at locating “hot spots”, and
2. A bacterial source tracking study to determine the sources of fecal coliforms present in the basin’s waterways.

The general source-tracking program would consist of grab samples collected for at least two events at a large number of sites throughout the watershed. The parameter set for the general source tracking program would include field parameters and nutrients similar to the EPC’s ambient program but should also include metals, pesticides, chlorine, foaming agents, or other “unnatural” parameter indicative of environmentally unfriendly land use. This program could help the county “zero-in” on potential problem areas that may then be targeted for management actions.

Fecal contamination is one of the more severe water quality issues in the Alafia River Watershed as demonstrated by the magnitude and frequency of fecal coliform counts reported in past monitoring. Fecal coliform, a bacteria found in the digestive tracts and feces of wild and domestic animals and humans, is used as an indicator of fecal contamination; the presence of these indicator bacteria is not revealing as to the source of the fecal pollution, which is an important factor for risk assessment and planning for corrective action.

Several methods, together known as bacterial source tracking (BST) methods, have been developed to identify fecal indicator bacteria in order to determine their host or source (e.g. human, dog, wild animal). These methods are be based on either the genetic make-up of the bacteria, or on physiological characteristics such as resistance to various antibiotics. The University of South Florida Department of Biology is at the forefront of BST research and employs antibiotic resistance analysis (ARA) to assess the source of indicator organisms

Valerie J. Harwood, a professor at the University of South Florida who has conducted numerous BST studies, provided the following description of the significance of fecal coliform in surface waters.

> *The goal of bacteriological water quality testing is, in large part, to identify water that contains human pathogens in order to protect public health. Ideally, water quality testing would reliably identify public health threats, while allowing full use of waters that do not constitute a health threat. This goal has been elusive, in part because of the limitations of the methods we use. It is difficult, time-consuming and expensive to directly quantify disease-causing bacteria and viruses, and virtually impossible to test for all possible pathogens in a water sample. Thus, we quantify indicator bacteria, whose presence more-or-less reflects the probability that there are pathogens in the water. A major problem with the fecal coliform indicator is that it is a poor predictor of some human pathogens, particularly enteric viruses, but can also be present in waters where there are few or no viral, bacterial or protozoan pathogens. The same problem exists when* E. coli*, a member of the fecal coliform group, or* Enterococcus*, a different bacterial group, are used as indicator organisms for water quality.*
>
> *One of the major reasons that fecal coliforms are inadequate indicators is that they are present in the gastrointestinal tract of all warm-blooded animals and some cold-blooded animals. Some animal feces, i.e. those of humans, cattle, and swine, have a higher probability of containing human pathogens than the feces of most other species, therefore many water quality experts would place contamination from these animals in a "high risk" group. Human feces are considered particularly dangerous because of the human-specific viruses transmitted exclusively by human sources. Very low levels of fecal indicator bacteria from a high-risk animal group indicate a greater potential health hazard than higher levels of indicator bacteria from a low risk animal group. There is, however, no testing method approved by regulatory agencies such as the EPA that can be used to determine the source (i.e. cow, human, dog) of fecal indicator bacteria. Such a method would allow much more accurate risk assessment than we can achieve with standard testing methods. It would also allow regulatory agencies to more effectively identify and eliminate the source of bacterial contamination to natural waters, and would contribute greatly to the accuracy of total maximum daily load (TMDL) models.*

Specific Source Tracking Sampling Recommendations

Specific locations for the general source-tracking program should be selected to provide watershed-wide coverage while focusing on areas thought to contribute to nonpoint source pollution. These would include the vicinities of wastewater discharges (surface and subsurface), septage spreading areas, concentrated septic tank areas, agricultural areas (crops in fallow and growing season as well as livestock operations), urbanized areas, and others. Some of the specific areas of concern noticed during the course of this study include

- Drainage ditch in River Walk Trailer Park,
- Drainage ditch in Alderman Preserve cut through artesian area off Turkey Creek Road (per Cheryl Bowman, ELAPP),
- Finger canals downstream of Magnolia Street, and
- Sites of proposed water quality improvement projects.

The BST program should be implemented in each major subwatershed. If this is not possible Turkey Creek may be the best place to start.

15.4.2.4 Benthic Macroinvertebrates

The use of benthos data has proven to be a reliable monitoring tool, as benthic macroinvertebrates are sensitive to subtle changes in water quality. This type of monitoring is advantages because the status of a single series of samples can provide an indication of current environmental conditions. The organisms sampled can also provide a record of the prevailing conditions and typically are not affected by a single pollutant source.

Benthic infaunal, living within the substrate, organisms are normally considered indicators of the relative health of the system and are thought to reflect changes or fluctuations in environmental quality. Benthic organisms are good indicators of the relative ecological status of aquatic systems because they generally have limited mobility and cannot escape deteriorating environmental conditions. In general, a diverse benthic fauna without excessively large numbers of any one group is considered to be characteristic of good water quality. If the numbers of species should decrease, but the number of individuals of the remaining species increase from baseline conditions, it is usually an indication of water quality degradation, such as organic pollution. Thus, the knowledge of the kinds and abundance of benthic invertebrates help to indicate water quality trends.

The benthic sampling stations should be located at the same locations as the ambient water quality stations. By collecting aquatic biota at the same sampling station, data can be correlated to aid in the interpretation of any temporal or spatial changes to water quality.

Specific Benthic Macroinvertebrates Sampling Recommendations
Tampa Bay Water's HBMP provides good coverage for the Alafia River. Each of the remaining stations (this excludes EPC Stations 74, 153, and 114) should be considered for benthic sampling. Key stations include EPC Stations 139, 151 and 154 as well as new stations BUCK1, BELL1, FISH1, and NPRONG1.

15.4.2.5 Fish
The presence or absence of certain fish provides insight into a system's environmental health and condition; therefore, fish should be sampled and assessed to fully characterize the important species, seasonal variability, community structure, and preexisting stresses associated with the aquatic biological communities of the watershed.

Fish should be sampled at in or in the vicinity of the ambient stations. Since the physical condition of each station will vary, a combination of seining, dip/cast netting, electroshocking, and/or funnel traps can be employed to sample the resident fish communities.

Fish collected during sampling are identified to the species level using an appropriate taxonomic key and released unharmed unless the plan of study indicates that at least one specimen of each species be preserved and archived. Fisheries surveys will provide an inventory of the local fish fauna, representative species lists for the various distinct habitats of the watershed, and diversity information on the resident populations.

Specific Fish Sampling Recommendations
Fish sampling stations should mirror the benthic macroinvertebrates stations.

15.5 OPERATION AND MAINTENANCE PLAN RECOMMENDATIONS

Comprehensive, regular maintenance of stormwater management systems is essential to ensure the efficient function of existing stormwater conveyances and that new stormwater facilities, once constructed, continue to function within their original design parameters for many years. Maintenance is also often required for prevention of water quality degradation, exotic species control, aesthetics, and safety reasons. This section outlines recommended maintenance practices and schedules for the Alafia River Watershed.

15.5.1 Routine Maintenance Activities

Mowing and Clearing Practices
The mowing of grass and clearing of channels is the most typical maintenance work performed by County Service Unit maintenance crews. Side slopes, embankments, emergency spillways, and other grassed areas of stormwater systems should be periodically mowed. This prohibits growth of woody species and controls

herbaceous weeds. Occasional hand removal of invasive vegetation is required. Residue from ditch clearing is of two types, cut vegetation and the sediment and soils removed from structures or ditch reshaping. Remains of these activities should not be lost within the channel nor piled along the banks of the ditch. Otherwise, the next large storm event will simply wash these materials downstream to clog downstream structures or pollute downstream waterways. Once heavy vegetation is cut, it should be removed from the channel and disposed of, preferably at a composting facility, as it does not contain the metals or environmentally objectionable materials that the soils contain. The soil residue must be disposed of at approved landfills.

The use of water-tolerant, pest-tolerant and slow growing grasses is recommended when appropriate. Planting with native wetland species is even more appropriate as is the creation of longitudinal wetland/sloughs to provide opportunities for stormwater treatment. Note that excessive vegetation, particularly exotic or invasive species and plants with stiff, woody stems is not the same as planting with native species however. This kind of growth can greatly increase the resistance to flow, reducing the capacity of the channel, cause blockages to culverts and bridges, and ultimately generate higher flood levels.

Excessive sediment accumulation also reduces the capacity of the channel to convey floodwaters by reducing the cross sectional area and hydraulic radius of the channel, creating an effect similar to that of excessive vegetation as described above.

Erosion Control Practices

Channel degradation, embankment instability and channel bed loss are results of erosion and scour caused by instability in the equilibrium of the geometry of the stream system. Erosion and scour are a natural part of stream geomorphology. The stream minimizes the energy needed to move sediment and water, evenly distributing that energy along the reach. This creates the meander or movement of the stream back and forth within the floodplain over time.

Anthropogenic activities disrupt this equilibrium, causing excessive suspended sediments in the streams, channel degradation, embankment instability and channel bed loss. Excessive suspended sediments may result in undesirable environmental impacts, aesthetic problems, and high maintenance costs.

Erosion protection should be addressed during the design phase of each project recommended in this study. Typical erosion control standards are slope control, i.e., 3H:1V minimum side slopes planted with native vegetation. For steeper side slopes there are man-made and natural materials that can be used for erosion protection of stream banks such as erosion control blankets, mats and grids. There are “hard” protection materials such as riprap, gabions, armorjacks, etc. and for the ultimate protection, there are walls and channel linings.

Poor agricultural practices are a common cause of sediment transport within the Alafia River Watershed. Agricultural activities are not regulated in the same fashion as other anthropomorphic land use activities and many farmers do not incorporate any type of best management practices. As a result, certain agricultural activities, in particular the use of plastic mulch, create a variety of stormwater management problems, one of which is increased downstream sediment loads. This topic is discussed further in Chapter 15.6.

Stormwater Management Facility Maintenance and Rehabilitation

Qualified personnel should conduct periodic inspection of all existing and new stormwater management structures for structural integrity, safety, accumulated sediment, vegetation, and obstructions. Vegetation and accumulated sediment should be removed, as needed, from water level control structures to ensure proper functioning. These facilities should be able to function for several decades without requiring regular maintenance except for that described above. However, all infrastructure is continually deteriorating and should be inspected periodically (approximately every 2 years) to identify those in need of replacement. When they are identified for replacement, the design should be evaluated to determine the appropriate size for the structure to meet current design criteria for the flood protection level of service.

There are many older stormwater facilities located throughout the Alafia River Watershed, which do not have access easements or right-of ways such that maintenance crews are able to perform maintenance on these facilities. This creates a difficult situation for the Service Units. If County access to a stormwater facility doesn't exist or is insufficient, then an easement or legal agreement with adjacent property owners needs to be secured for maintenance access. It should not be the responsibility of the maintenance crews to find solutions for these situations nor should these situations simply be overlooked or viewed as hopeless.

New facilities are required by the Planning and Growth Management Department's Stormwater Management Technical Manual to provide drainage easements of sufficient size to accommodate maintenance. This is an element of the development review permitting process that should not be overlooked. Stormwater department and Service Unit review should be included as part of the review process before new development plans are approved.

15.5.2 Identified Maintenance Needs

Table 15.5-1 lists specific locations by subwatershed within the Alafia River Watershed with immediate maintenance requirements. These locations were identified over the course of this study during field investigations, interviews with County Service Unit personnel, and review of field survey records and photographs recorded by survey crews. Table 15.5-1 lists the location, nature of maintenance problem, and recommended course of action to be taken.

Table 15.5-1
ALAFIA RIVER WATERSHED MANAGEMENT PLAN
IDENTIFIED MAINTENANCE NEEDS

Channel Segment / Structure Location	Description	Maintenance Needs	Access	Notes
BUCKHORN CREEK SUBWATERSHED				
Buckhorn Creek main channel east of Kings Avenue	Channel bank erosion is recurring problem where Tributary C enters Buckhorn Creek near Van Gogh Circle.	Channel bank needs reinforcement with hand-placed riprap to stabilize.	County has no easement. Requires right of entry from local residents.	County Service Unit has been performing repairs in the past.
Buckhorn Creek main channel between Bloomingdale Plaza and Holland Drive	Segments of channel are completely overgrown with heavy vegetation.	Channel vegetation needs to be removed to restore channel conveyance capacity.	County has no easement. Requires right of entry from local residents.	Inspect annually and maintain as needed.
Buckhorn Creek main channel west of Bell Shoals Road	Channel is completely overgrown with heavy vegetation.	Channel vegetation needs to be removed to restore channel conveyance capacity.	County has no easement. Requires right of entry from local residents.	Inspect annually and maintain as needed.
Tanglewood Ditch from Viola Drive to Kings Avenue	Channel is completely overgrown with heavy vegetation. Culvert crossing opposite Lakehurst Way function is impaired.	Channel vegetation and sediment deposits need to be removed to restore channel conveyance capacity. Culvert crossing needs to be cleared of vegetation and sediment deposition.	County has access.	County Service Unit has been performing maintenance in the past. Frequency should be increased to annual.
Tributary D from Buckhorn Creek to Ronele Drive	Channel is completely overgrown with heavy vegetation.	Channel vegetation needs to be removed to restore channel conveyance capacity.	County has no easement. Requires right of entry from local residents.	Inspect annually and maintain as needed.
Craft Road Ditch from Bryan Road to Bell Shoals Road	Segments of channel are completely overgrown with heavy vegetation.	Western end serves as treatment/mitigation facility and needs periodic maintenance. Channel vegetation in upstream segment needs to be removed to restore channel conveyance capacity. Bell Shoals Road culvert needs regular cleaning.	County has no easement for channel maintenance. Requires right of entry from local residents. Bell Shoals Road culvert is within County right-of-way.	Inspect annually and maintain as needed.
Tributary GG wetland outfall north of Bloomingdale Avenue	Control structure buried among debris and sediment.	Clear out accumulated debris around structure and clean out any sediment or blockage of outfall.	County has no easement. Requires right of entry from local residents.	Structure controls significant upstream drainage system. Inspect annually and maintain as needed.
Tributary GG culvert at Bell Shoals Road	Culvert inlet and outlet buried among heavy vegetation and sediment accumulation.	Clean out ditches at upstream and downstream ends of culvert and remove any sediment deposits.	Bell Shoals Road culvert is within County right-of-way.	Inspect annually and maintain as needed.
Tributary F at Rosemead Lane	Segments of channel immediately downstream of Rosemead Lane culvert overgrown with heavy vegetation.	Clear out accumulated vegetation and debris around structure and clean out any sediment or blockage of outfall.	Rosemead Lane culvert is within County right-of-way.	Inspect annually and maintain as needed.
Bloomingdale West pond and wetland control structures at Lakes BL-1, J-1, J-2, K, and M-2	Lake and wetland control structures overgrown by vegetation and design function impaired.	Remove excessive vegetation growth around structures and clean out any sediment or blockage of outfall.	County has no easement for access to structures. Requires right of entry from local residents and/or homeowners association.	Structures control entire Bloomingdale West drainage system. Inspect annually and maintain as needed.

Table 15.5-1
ALAFIA RIVER WATERSHED MANAGEMENT PLAN
IDENTIFIED MAINTENANCE NEEDS

Channel Segment / Structure Location	Description	Maintenance Needs	Access	Notes
BUCKHORN CREEK SUBWATERSHED				
Hurley Ditch from Bloomingdale Avenue to Bloomingdale High School	Channel is completely overgrown with heavy vegetation and dirt road culverts blocked. Ditch at irregular grade with sediment deposits.	Channel vegetation needs to be removed and channel regraded to restore channel conveyance capacity. Culverts need to be cleared of blockage.	County has no easement. Requires right of entry from property owner(s).	County Service Unit has been performing maintenance in the past. Affects flooding conditions upstream in Bloomingdale HS campus. Maintenance frequency should be increased to annual.
Bloomingdale High School drainage system	School stormwater system enclosed ditch. Pond interconnections silted and overgrown by vegetation.	Channel vegetation needs to be removed from blocking of pond/wetland outfalls and sediment deposits removed from within storm sewers to restore design function of system.	Property owned by Hillsborough County School Board. Requires right of entry.	Improper performance of high school drainage system affects adjacent and upstream contributing drainage areas. Inspect annually and maintain as needed.
Northeast Tributary at Bell Shoals Road culverts	Culvert inlet and outlet affected by heavy vegetation and sediment accumulation.	Clear out accumulated vegetation and debris around structure and clean out any sediment or blockage of outfall.	Bell Shoals Road culvert is within County right-of-way.	Critical point on conveyance system; requires semi-annual inspection and maintenance as needed.
FISHHAWK CREEK SUBWATERSHED				
Dorman & Boyette Road	Culvert & culvert entrance clogged with sediment and vegetation.	Remove sediment from pipe. Periodic removal of excessive vegetation at culvert entrance and exit.	All work can be accomplished within the right-of-way.	Inspect semi-annually.
TURKEY CREEK SUBWATERSHED				
North of Sparkman Road and west of Gerald Hall Road	Gerald Hall cross culvert clogged. Ditches overgrown with torpedo grass.	Maintain roadway drainage system, including cross drains, culverts, and ditch system. Remove excess vegetation and debris from conveyance and culvert entrances/exits.	All work can be accomplished within the right-of-way.	Inspect semi-annually
Little Alafia River channel just upstream of Holloway Road	Excessive seasonal sediment deposition.	Flooded overbank. Sediment removal of roadway drainage system including culverts, bridge, and ditch system.	Easement maybe required upstream of right-of-way.	See water quality projects TURK-xWQ and TURK-xxWQ. If these are not implemented, inspection should be quarterly and maintained as needed.
Grassy Creek @ Murray Farms Road & Trapnell	Residnets complain channel is not maintained.	Clear channel. Remove exotic species.	Permission to access and maintain creek must be acquired from land owners or easement may be required.	Inspect every 2-5 years.
Turkey Creek Tributary B at Charleston Avenue	Channel is overgrown with heavy vegetation upstream and downstream.	Channel vegetation needs to be removed to restore channel conveyance capacity.	County has easement.	Inspect annually and maintain as needed.
Little Alafia River Tributary A at Turkey Creek Road	CMP under road has one foot of accumulated sediment deposit and excessive vegetative growth around inlet and outlet.	Clear out accumulated vegetation and debris around structure and clean out any sediment or blockage in structure.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.

Table 15.5-1
ALAFIA RIVER WATERSHED MANAGEMENT PLAN
IDENTIFIED MAINTENANCE NEEDS

Channel Segment / Structure Location	Description	Maintenance Needs	Access	Notes
TURKEY CREEK SUBWATERSHED				
Medard Reservoir Tributary A at HWY 39 and RR tracks	Culverts have excessive accumulated sediment and overgrown vegetation at outlets.	Clear out accumulated vegetation around structure and clean out any sediment or blockage in structure.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.
Grassy Creek tributary at Drawdy Road and Holloway Road	CMP under road is over half clogged with accumulated sediment.	Clear out accumulated sediment in structure to restore proper conveyance.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.
Grassy Creek tributary at Mud Lake Road north of Holloway Road	CMPs under road are clogged with accumulated sediment (probably from strawberry fields).	Clear out accumulated sediment in structures to restore proper conveyance.	All work can be accomplished within the right-of-way.	Inspect semi-annually and maintain as needed.
Sydney Road, south of Salem Church Rd, (model junction number 753580)	Culvert clogged with sediment deposits.	Clear out accumulated sediment in structures to restore proper conveyance.	All work can be accomplished within the right-of-way.	Inspect quarterly and maintain as needed. May need more frequent maintenance. (See Project TURK-4WQ.)
Structures at intersection of Jerry Smith Road and April Lane. April Lane cross drain.	Sediment accumulation in ditch and structure. CMP is deteriorating.	Clean out ditches at upstream and downstream ends of culvert and remove any sediment deposits.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.
Railroad culvert west of N. Dover Road, due west of SW of Salem Church Road	Culvert is clogged by sediment accumulation.	Clean out accumulated sediment in structures to restore proper conveyance capacity.	County has no right-of-way or drainage easement. Property is owned by the CSX Railroad.	Inspect annually and maintain as needed.
Private drive north of Sydney Road, model junction number 754240	Makeshift weir has been constructed across channel. Trash, debris and 55-gallon drum litter floodplain.	Clean out ditches at upstream and downstream ends of culvert. Remove debris and 55-gallon drum(s).	County has no right-of-way or drainage easement. Will require permission or right of entry from resident(s).	Inspect every 2-5 years.
Forbes Rd between Jerry Smith Road and Downing Street	Driveway culverts along Forbes Road drainage system are partially to fully blocked with sediment accumulation.	Clean out accumulated sediment in structures to restore proper conveyance capacity. Replace deteriorated culverts as needed.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.
ENGLISH CREEK SUBWATERSHED				
Frank Moore Road	Culverts are partially blocked by trash and sediment accumulation.	Clean out ditches at upstream and downstream ends of culvert and remove any sediment deposits.	Frank Moore Road culvert is within County right-of-way.	Inspect annually and maintain as needed.
Horton Road culvert, b/n Berry Road and Colson Road	Culverts are partially blocked by trash and sediment accumulation.	Clean out ditches at upstream and downstream ends of culvert and remove any sediment deposits.	Horton Road culvert is within County right-of-way.	Inspect annually and maintain as needed.
The RR culvert at node 791888 is clogged.	The RR culvert at node 791888 is clogged.	Clean out ditches at upstream and downstream ends of culvert and remove any sediment deposits.	County has no easement. Requires right of entry from local residents.	Inspect annually and maintain as needed.

Table 15.5-1
ALAFIA RIVER WATERSHED MANAGEMENT PLAN
IDENTIFIED MAINTENANCE NEEDS

Channel Segment / Structure Location	Description	Maintenance Needs	Access	Notes
ALAFIA RIVER MAIN STEM SUBWATERSHED				
Tributary N-10 at the intersection of Hannaway Drive and Providence Road	A 36" CMP is badly corroded and clogged with accumulated sediment. The downstream channel bed is laden with sediment and vegetation.	Clear out accumulated sediment in corroded structure or replace it. Dredge out downstream channel of sediment and remove excess vegetation.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.
Tributary S-6 under Shallow Creek Lane south of McMullen Loop.	A 42" CMP is clogged with accumulated sediment and debris.	Clear out accumulated sediment and debris in structure. Remove excess vegetation from upstream and downstream channel.	County has no easement for channel maintenance. Requires right of entry from local residents. Culvert is within County right-of-way.	Inspect annually and maintain as needed.
Tributary N-2 under Riverlachen Way south of Riverview Drive.	Two 29"x44" ERCPs are partially clogged with sediment, limiting hydraulic capacity.	Clear out accumulated sediment in structure to restore proper conveyance capacity.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.
Alafia Drive and Desoto Road.	County constituent complained of general lack of maintenance of local drainage ditches and culverts.	Inspect local drainage features in the area and clear/maintain as needed.	All work to be accomplished should be within the right-of-way.	Inspect annually and maintain as needed.
Hillsborough Association for Retarded Citizens (H.A.R.C.) on Hackney Drive east of HWY. 301	All culverts in drainage system are partially clogged with sediment.	Clear out accumulated sediment in structures to restore proper conveyance capacity.	County has no easement. Requires permission for right of entry from Association.	H.A.R.C. is privately owned but indicated County has maintained on-site drainage in the past.
Tributary N-15 south of River Oaks Circle	Channel in County-owned drainage easement is overgrown with heavy vegetation.	Channel vegetation needs to be removed to restore channel conveyance capacity.	County has easement but may require right of entry from local residents.	Inspect annually and maintain as needed.
Tributary N-19 at Lithia Pinecrest and Adelaide Avenue	CMP under road is over half clogged with accumulated sediment.	Clear out accumulated sediment in structure to restore proper conveyance capacity.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.
Rice Creek Tributary under McMullen Road north of Shadow Run Blvd.	Culvert inlet and outlet buried among heavy vegetation and sediment accumulation.	Clean out ditches at upstream and downstream ends of culvert and remove any sediment deposits.	McMullen Road culvert is within County right-of-way.	Inspect annually and maintain as needed.
Tributary S-9 at Lithia Springs Road	CMPs under road are clogged with accumulated sediment and debris.	Clear out accumulated sediment and debris in structure to restore proper conveyance.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.
Tributary S-10 at Lithia Pinecrest Road	Culvert inlets and outlets buried among heavy vegetation and sediment accumulation.	Clear out accumulated sediment deposits in culverts and clear excessive vegetation at structure and outlets.	All work can be accomplished within the right-of-way.	Inspect annually and maintain as needed.
Tributary N-10 between Providence Road and Alafia Drive	Segments of channel are completely overgrown with heavy vegetation.	Channel vegetation needs to be removed to restore channel conveyance capacity.	County has no easement. Requires right of entry from local residents.	Inspect annually and maintain as needed.
Tributary N-20 at Lithia Pinecrest Road	CMP connecting box culverts to small pond south of Lithia Pinecrest Road is clogged and damaged.	Replacement of this CMP with a new pipe is recommended. This will restore proper conveyance to the system.	County has no easement. Requires right of entry from local resident.	Critical point on conveyance system; requires semi-annual inspection and maintenance as needed.

15.5.3 General Maintenance Recommendations

Preventative, regularly scheduled maintenance is highly preferable and cost effective as opposed to an alternative crisis management style of maintenance. A sound operation and maintenance plan will have an inspection and monitoring program, integrated with a tracking system, to prioritize and schedule necessary maintenance.

Hillsborough County Service Unit staff has indicated they spend a majority of their time responding to non-scheduled maintenance activities driven by complaints and/or crises. A complaint triggers an investigation and based on the investigation, a priority ranking is assigned. While non-scheduled activities are to be expected, they should be controlled such that scheduled maintenance activities are the primary focus during normal routines of the year.

The most obvious need within the Alafia River Watershed for the maintenance department, and the Hillsborough County Service Units in general, is the need to develop a systematic strategy to record, assess, and respond to flood complaints. Documentation is a fundamental element to a good operation and maintenance plan. The County was prompted to start a database for recording flooding complaints due to the 1997 and 1998 El Nino storm events. This was and is an excellent initiative but did not include enough information to make it as useful as it could be. As a minimum, recorded information should include:

- Name and address of the individual lodging the complaint
- Location and nature of flooding problem
- Contact information
- Dates of complaint and flooding event

Section 15.6.6 describes more in depth recommendations for a flooding records database.

The database of flooding complaints should be linked to another similar database consisting of recorded maintenance activities. This would include the following types of records:

- Description of problem
- Cause for investigation
- Age of structure, condition, elevations, dimensions
- Investigator or point of contact
- Dispensation of problem
- Equipment used
- Hours of labor expended
- Digital pictures

The County is currently developing a GIS database that will inventory all of the drainage systems within the County. This will also be integrated with a maintenance

schedule / tracking system. More specific recommendations related to these topics are discussed in Section 5.6.

Other documentation necessary to a successful maintenance plan is maintenance standards. Maintenance standards (also being currently developed by the County) are essential tools that will assist in prioritizing maintenance activities by providing a common "basis" for determining staffing, equipment and material requirements.

Access, right-of-ways and easements can be difficult issues for the County's Service Units. The County, as a rule, does not perform maintenance activities on private property, yet activity (or non-activity) on those properties can impact the County's drainage system. Examples of this include maintenance of facilities within railroad right-of-ways, FDOT facilities, and systems owned and operated by homeowners associations. The County should perform regular monitoring of those facilities, which impact the County's ability to provide a functioning drainage system and require action when necessary.

Toolkits for County residents should be distributed when a flooding complaint is registered. The toolkit would be an array of educational materials explaining the responsibilities and limitations of the stormwater department and Service Units, the rights and responsibilities of property owners, stormwater management techniques on a microscale, the hydrologic cycle, what constitutes a true flooding problem versus an assumed flooding problem, and appropriate fact sheets as described in Section 15.6.7. The intent of the toolkit would be to educate residents and ultimately reduce the quantity of flooding complaints.

Wherever possible, County projects should employ the use of non-corrosive, non-crushable reinforced concrete pipes with headwalls. If metal or plastic pipes are used, concrete headwalls should be required to protect ends from damage. Although the County Stormwater Technical Manual allows corrugated metal and HDPE pipes, reinforced concrete pipes are the preferred material due to superior resistance to physical damage, corrosion and deterioration over time.

15.6 PROPOSED WATERSHED MANAGEMENT RECOMMENDATIONS

Over the course of development of the Alafia River Watershed Management Plan, many problems and issues were presented to Parsons staff, from a variety of sources, which do not necessarily relate to the development and implementation of structural solutions for watershed management. These issues deal with the policies, practices, and programs related to watershed management that are either in practice, deficient, or absent within the County. This section is intended to present a list and discussion of recommendations to deal with some of these issues as a part of the overall watershed management plan.

15.6.1 Maintenance and Updates of Alafia River Watershed Management Plan

1. It is recommended that Hillsborough County adopt a strict data-ownership model for the continued maintenance and update of the Alafia River Watershed Management Plan. One individual or a small group of individuals would be given responsibility for maintenance of geographic data. A separate group would be given responsibility for maintenance of the Alafia River Watershed stormwater management model data. Perhaps a third group would assume ownership of data archives. These groups would develop protocols for maintenance of data under their charge. Individuals that do not possess ownership status would not be permitted to edit or change archived data. This strict data-ownership model will ensure that data are maintained and accurate. Data owners would possess sufficient professional qualifications to understand the data under their charge and sufficient communication skills to articulate complex concepts related to data under their charge to lay constituents, County staff, and other bureaucracies.
2. It is recommended that Hillsborough County adopt a strategy to update the Alafia River Watershed Stormwater Management Model. Once every calendar year, Hillsborough County would re-issue a digital document entitled *The Alafia River Watershed Stormwater Management Model*. The County would publish the document on both a compact disk and Internet medium. The document would be offered to all, free of charge. The document would detail all constructed changes to the hydrologic system within and draining to the Alafia River within the unincorporated limits of Hillsborough County. Special appendices might also be published to detail proposed changes to the hydrologic system, which are permitted, under construction, or perhaps planned, but not constructed as of the date of re-issuance. The document would include the following data:

<u>Current Model Input Files</u>

These data must include input files for hydrology (the .wpx file) and for hydraulics (the .exd file). Hillsborough County would adopt a data presentation standard, which casts these data with strict alignments, headers, significant figures, and detailed comments.

The digital document would include a textual document that details the Hillsborough County input file formats, presentation standards, user's manual type data, and stylistic modeling requirements. The digital document would include the latest executable version of the Hillsborough County Stormwater Management Model. Finally, the digital document would include output for all hypothetical design storms, calibration storms, and verification storms. Input would be cast such that no errors exist within the output file. In addition, input would be cast such that all warnings are eliminated from output files, except the following two warnings: reverse-flow warnings and junction-not-associated-with-conduit warnings. Reverse-flow warnings are acceptable for adversely sloped

conduits. Junction-not-associated-with-conduit warnings are acceptable only for junctions connected to the hydrologic network by overland flow weirs.

Report

The digital document would include a report that describes the model. The report would detail data sources, methods, assumptions, challenges, and the degree of agreement or disagreement between calibration and verification events, and observed events.

15.6.2 Maintenance and Updates of Geographic Information Systems (GIS)

It is recommended that Hillsborough County adopt strict standards and protocols for the continued maintenance and update of the Geographic Information Systems database developed for its watershed management planning efforts. These data should meet or exceed the Southwest Florida Water Management District data standards. The County should adopt an ESRI data format. Shapefiles should be published in both UTM Zone 17 and State Plane coordinate systems. Imagery should be published in the relevant, native format. The digital document should include a copy of ESRI's ArcExplorer – a shareware program for viewing geographic information system data. Minimally the digital document should include the following shapefiles:

- ***Watershed, basin, and sub-basin delineations as polygons.*** Each polygon should include attributes for data in the WP card of the Stormwater Management Model hydrology file – the .wpx file. WP data include unique sub-basin identification numbers, area, and curve number.
- ***Drainage alignments as polylines.*** Each polyline should include attributes for alignment type (river, creek, ditch, swale, culvert, weir, drop structure, curb or drop inlet, storm drain), data source class (professional survey, observation, estimation from resource material), data source reference (name and data of professional survey, name and date of observation, reference from which estimation is made), notes on model deviation from data source, and data from the C1, C2, C3, C4, and G1 cards of the Stormwater Management Model hydraulics file – the .exd file. These data include unique identification numbers, geometry, and length characteristics.
- ***Stormwater Management Model node locations as points.*** Each point should include attributes for data source class (professional survey, observation, estimation from resource material), data source reference (name and data of professional survey, name and date of observation, reference from which estimation is made), notes on model deviation from data source, and data from the D1, E1, and E2 cards of the Stormwater Management Model hydraulics file – the .exd file. These data include unique identification numbers, elevation, and storage characteristics.

- ***Stormwater Management Model link alignments as lines.*** Each line should include attributes for link type (open channel, closed conduit, weir), and a unique identification number to associate drainage alignment attributes.
- ***Storage features as polygons.*** Each polygon should include attributes for feature type (wet stormwater management pond, dry stormwater management pond, natural wetland, natural lake, natural pond, constructed wetland, constructed lake, constructed pond, natural depressional area, man-made depressional area).
- ***Photograph locations as points.*** Each point should include attributes for orientation of photograph (a bearing in degrees with 0 for north, 90 for east, 180 for south, and 270 for west) and photograph number. Photographs should be available for download from the Hillsborough County Internet site, stored by photograph number.
- ***Road alignments as polylines.*** Road alignment data should be cast such that users can perform geo-coding operations.
- ***Tax assessors' parcels and easements as polygons.***
- ***Southwest Florida Water Management District Environmental Resource Permit data as polygons.*** These data are available from the District's web site.
- ***Topographic data as polylines.***
- ***Digital Orthophoto Quarter Quadrangles.***
- ***Aerial photographs.***

Geographic information system data should also carry a re-issuance date stamp and a last-revision date stamp. The re-issuance date stamp should reflect the most recent re-issuance date, under which the data is published; the last-revision date stamp could reflect the date in which the datum took the current orientation or alignment. The re-issuance date stamp will be the same for all data within a re-issuance; the last-revision date stamp is a function of the age of the data. Last-revision date stamp might be the earliest re-issuance date in which the data appeared in the current form, or perhaps a more specific date such as the as-built certification date or date that a photograph was made.

All geographic information system data should include metadata documentation and standard ArcView Label files – .avl files. These files standardize the color scheme, line type, and line weight presentation of data. The digital document should also include a textual document that details Hillsborough County data.

15.6.3 GIS Inventory of Stormwater Structures

Hillsborough County has completed a countywide stormwater structure and facilities inventory with the help of the University of South Florida, Florida Center for Community Design and Research, School of Architecture and Community Design. The objective of the Hillsborough County Stormwater Inventory was to assist the

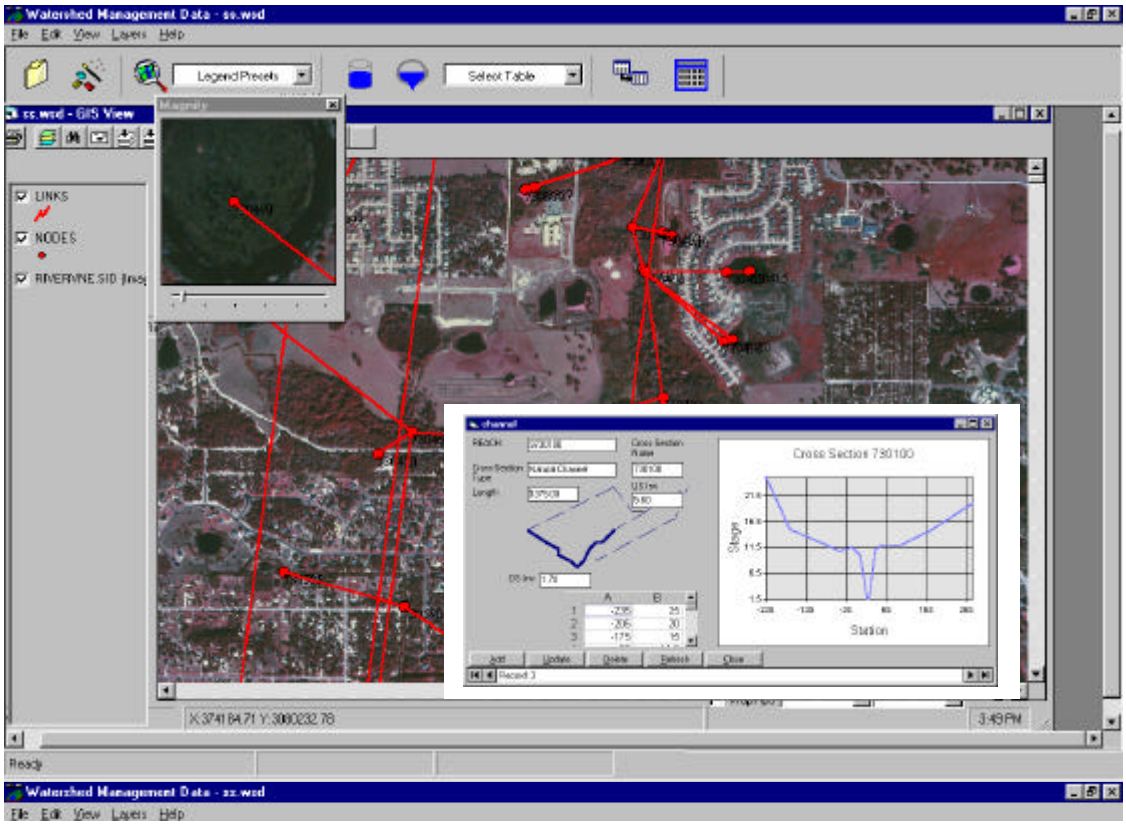
County with the creation of a Stormwater Atlas. The scope of this work involved mapping the existing stormwater infrastructure and the development of a stormwater management system interface by which County staff can identify stormwater features, attribute stormwater infrastructure data to photographs, plot maps, generate reports and update existing data.

Data from this structure and facilities inventory should be integrated into the GIS database. Attribute, positional, and accuracy of spatial data needs to be maintained. Tolerances and other Quality Control/Quality Assurance parameters should be documented and preserved.

15.6.4 Graphical User Interface for County Model

The County should consider developing a Graphical User Interface (GUI) for the Hillsborough County SWMM. There are two basic potential development paths – a software designed to operate inside ArcView or a standalone software. The ArcView version (VBA Version) would be developed in ArcObjects, ESRI's version of Visual Basic for Applications (VBA), and the standalone version (MO Version) would be developed using a COM-compliant programming language, such as Visual Basic, and ESRI's Map Objects. Map Objects is a good graphics control with numerous intrinsic functions for merging graphic and database elements into a seamless GUI design. Both of these potential software programs would use a relational database to store model and other watershed data. This arrangement is similar to the GUI pictured on the following page that was developed by Parsons to import and edit model data in the SWFWMD data standard.

The advantages of developing the VBA version include reduced development effort as well as the benefits associated with having the entire ArcView interface and functionality available during a model-editing session. The disadvantage is that the user must have access to ArcView 8.x and may need proficiency at using ArcView 8.x; however, the interface could be designed in such a way that minimizes the need for ArcView experience. The reason that ArcView 8.x would be used instead of ArcView 3.x is that the Avenue scripting language is fading from use along with other ArcView 3.x products. VBA is not supported in ArcView 8.x; therefore, it is advisable to migrate away from Avenue and place software development efforts in a product that has a more secure future.



The main advantage of developing the MO Version is that the user would not need any other software. There are some licensing issues associated with the use of Map Object. A $100-royalty fee is due to ESRI for each copy of the program produced. A royalty free version of Map Objects is available that could be used as a model viewing software, but could not be used to add links or nodes to the model. If the model connectivity were maintained externally from the program, such as though an Avenue script or a VBA module, then the royalty free version could be used for the remainder of the desired software functionality.

Result graphs, profiles, model input and results, photographs, and other model data would be stored in a database. Click-events on the graphics screen would initiate SQL commands to the database and the requested information would be retrieved. A major advantage of using a database is that much of the development effort, especially in regards to reporting, can be removed from the main development path and incorporated within the database using queries and database reporting tools such as Crystal Reports. Scenario management and access to parameter backup documentation would greatly be enhanced over current practices. In addition, read and write access can be controlled through the interface to set various security privileges.

Use of a GUI would provide significant improvement in both model development speed, model organization, presentation graphics, and the capacity and ease of model updates.

15.6.5 Improved Water Quality Model

The County should consider using an improved water quality model. One of the limitations of the County's existing nonpoint source assessment methodology rests in the fact that each basin "stands alone"; that is, connectivity is not considered. This inhibits efforts to determine loadings at particular points of interest and prohibits simulation of multiple BMPs in series. In addition, the use of continuous simulations would improve model results, as would the ability to consider hydraulic and water quality-loading rates in BMP evaluations. The ability to incorporate point source loads and use different "buildup" and "washoff" algorithms would also represent significant improvements to nonpoint source assessments in Hillsborough County. For these reasons the incorporation of EPA's Stormwater Management Model (SWMM) should be considered.

Hillsborough County SWMM models (HCSWMM) can be converted to EPA SWMM models capable of simulating continuous hydrology and water quality. Numerous approaches are available to meet this goal. The primary difference between these approaches centers on the selected routing model block and the ease with which model updates can be accomplished.

The Hillsborough County SWMM model of the Alafia River Watershed is a single event-based hydrologic and a hydraulic model. This model was prepared using Hillsborough County's own version of the SWMM Runoff and Extran blocks. While there is limited difference between the Hillsborough County and EPA versions in regards to the hydraulics (Extran), significant differences exist in the Runoff Block. The Hillsborough County Runoff Block is of limited value for building a model capable of simulating continuous hydrology and water quality; however, the Extran data from Hillsborough County model will greatly speed development of the routing component of the new model.

A SWMM model for the Alafia River could use the Runoff Block to generate hydrographs and pollutographs. Hydraulic routing and BMP simulation could be accomplished using the Runoff or Transport Blocks. Using the Transport Block for flow routing will provide more flexibility in the future as point source loads can be inputted and BMPs can be simulated in greater detail; plus, natural sections are not allowed in the Runoff Block which would require a fair amount of conversion in order to use the existing cross sections from the Hillsborough County SWMM model of the Alafia River Watershed. On the other hand, if the County desires to apply a similar model in other areas and does not anticipate that detailed cross-sections will be available, use of the Runoff Block for hydrology, quality, and routing may be considered due, in large-part, to recent improvements to the SWMM model made by Dr. Wayne Huber of Oregon State University (OSU). OSU's SWMM Version 4.4 allows for runoff from one subcatchment to be directed to another subcatchment, instead of having to flow into a channel/pipe or inlet, thus allowing for summing of masses without the need for hydraulic information. This improvement will also allow for simulation of riparian zone and overland flow BMPs. In addition Version 4.4

contains removal mechanisms in Runoff Block channel or pipes thus eliminated the requirement of having a Transport model to simulate BMPs.

The application of SWMM need not be overly complicated; in fact, minimal SWMM elements could be incorporated to improve results without increasing the complexity over current methodologies. For example, the SWMM Runoff Block could be used to determine runoff volumes. This could be accomplished by using only those parameters that are most sensitive in regards to flow volume. Parameters that have minimal effect on volume (i.e., impervious area roughness) could be specified as defaults or calculated internally (i.e., subcatchment width). The volume-sensitive parameters would be specified per landuse and landuse/soil combination just as they are now. The result would be improved runoff volume, and therefore pollutant mass, estimates.

A graphical user interface (GUI) for the water quality model could be developed separately or incorporated in the GUI described in Section 15.4, above.

15.6.6 Internet Web Site Maintenance

Currently, public information is presented through the Alafia River Watershed Management Plan Internet site (www.alafiariver.org). At the completion of this project, the site will not be maintained. It is recommended that the County migrate the information, results of the investigation and future activities to a web site. The final report, including preferred project locations, existing model, text, figures, and data could be made available to the public and/or portions to stake holders with a security access code. A web site like the Hillsborough County Watershed Atlas (http://www.hillsborough.wateratlas.usf.edu/) is a good starting point. More information, a “member-only” security area, and updates to the report could enhance the site and its functionality.

15.6.7 Regulatory Use of Alafia River Watershed Model

It is recommended that Hillsborough County develop a regulatory framework around the Alafia River Watershed Model. The County would require that new hydrologic and hydraulic data submitted by developers, engineers, and hydrologists – meet County standards so that the County might use these data to ensure that groups wishing to modify the hydrologic system meet various Federal, State, and local regulations. This regulatory framework may require that an ordinance or rule be passed that details data submission requirements. The strategy might mimic the Federal Emergency Management Agency requirements for submission of revisions to National Flood Insurance Program Flood Insurance Rate Map and Flood Insurance Study data. An altered, proposed version of the Agency's strategy follows.

Hillsborough County might require that any individual who alters the primary, secondary, or tertiary hydrologic system within Hillsborough County submit a series of Hillsborough County Stormwater Management Model files to the County for review, approval, or archiving. The series of models are described below:

Effective Stormwater Management Model. This model comprises a digital copy of the last re-issuance of the pertinent watershed model. The constituent would submit a model of the entire watershed. The constituent will acquire these files and associated back-up data from the County.

Pre-Project Stormwater Management Model. The pre-project stormwater management model corrects any errors in, incorporates higher resolution into, and modifies the effective model to reflect changes to the hydrologic and hydraulic systems that occurred since the effective model re-issuance date and prior to the construction of the project-in-question. An error could be a technical error in the modeling procedures. Additional resolution might reflect development that was inadvertently omitted from the effective model or additional data that details the natural hydrologic system. Additional resolution must reflect the hydrologic and hydraulic system that was in place at the effective model re-issuance date. If no errors exist within the effective model, no resolution is added, and no modifications occurred since the effective model re-issuance date, then the pre-project model will be identical to the effective model. The constituent must also submit a report that details the changes that the constituent made to the effective model to generate the pre-project model. The constituent must submit backup data required to substantiate each change. These data must be submitted in a digital form: geographic information system shape files, AutoCad files, photographs as Joint Photographic Experts Group files (.jpg) or Bit Map files (.bmp), surveys, and paper documents.

Post-Project Stormwater Management Model. The pre-project model is revised to reflect the project. The post-project model must incorporate all changes to the hydrologic and hydraulic system since effective model re-issuance date, and the effects of the project. The constituent must also submit a report that details the changes that the constituent made to the pre-project model, to generate the post-project model. The constituent must submit backup data to support each change. These data must be submitted in a digital form: geographic information system shape files, AutoCad files, photographs, surveys and paper documents.

With these submittals, Hillsborough County will be able to determine the impact that a proposed project has on the hydrologic system by comparing pre-project and post-project models. Comparisons should be made with respect to peak flows, maximum flood stages, and volume of flood runoff. Federal Emergency Management Agency and Southwest Florida Water Management District regulations and codes can also be applied by comparing the pre-project and post-project models. Upon review and approval of submittals, Hillsborough County can use the data from the pre-project and post-project models as a means of continually updating and amending the watershed model for subsequent re-issuance.

15.6.8 Flooding Records Database

***Flooding Complaints*.** It is recommended that Hillsborough County improve its flooding complaint strategy. The County needs an effective strategy to record, assess, and respond to flood complaints as they are received. The strategy would involve geographic registration of complaint locations in a digital domain. This

strategy will capitalize on the costly mistake of failing to collect appropriate data during the 1997 and 1998 El Niño historical storm events. As a part of this program, Hillsborough County would develop a spatially enabled flooding complaints database. This application could be integrated with existing systems, such as Hansen and ESRI compatible GIS. A calling center application would take critical and relevant information from field technicians and the public and enter information into a spatial and relational database. This application or procedure would be used to log customer calls and initiate a request for service. The application would track the stormwater service unit's response to customer needs, and address problems before they get worse. The call tracking application could be used with a service and work order application. Such information as location, problem, caller information, detail, work assignment, progress and resolution would complete a minimal system. The registry database would include, but perhaps not be limited to, the following attributes:

- Complainant's name
- Complainant's address
- Complainant's telephone number
- County contact name
- Unique identification code for each complaint,
- Date of complaint
- Date of event
- Street location of reported problem, as street address or cross street reference
- Easting and Northing coordinates of problem location in UTM and State Plane coordinate system
- Estimated peak water-surface elevation at problem location from high-water mark survey or observations relative to a fixed topographic reference point
- Hillsborough County watershed where problem is located
- Hillsborough County subwatershed where problem is located
- Hillsborough County subbasin where problem is located
- Section, Township, Range where problem is located
- Nearest Hillsborough County Stormwater Management Model junction number
- 2-, 5-, 10-, 25-, and 100-year flood elevations at the nearest model junction
- Federal Emergency Management Agency Special Flood Hazard Area designation of the problem area

The County contact(s) would be an individual(s) with sufficient professional qualifications to understand flood hazard risk assessment, hydraulics, and hydrology, and with sufficient communication skills to articulate complex concepts to the County's constituents, and to solicit the information needed to thoroughly understand the specifics of the complaint and subsequently address it. All data would be generated in a digital environment; data that are not created in a digital environment would be digitized or scanned. Data gathered during the assessment or solution phase would be incorporated into the latest version of *The Hillsborough County Stormwater Management Model*. The contact would write a digital report that includes a textual description of each problem, as described by the complainant to the contact, proposed solutions, selected solution, status, and a record of correspondence. Digital pictures of the problem location and digitized facsimiles of all other supporting documentation would also be assembled.

Historical Flood Marks. Every time that a large storm event occurs in Hillsborough County, there is a valuable source of information that is made available to County stormwater planners that goes undiscovered and wasted. These storm events leave easily identified flood marks throughout the County in the form of debris lines on structures, channel banks, roads, and even houses. It is recommended that Hillsborough County begin the development of an historical flood mark database whereby designated County staff will be assigned geographic regions to roam following large storm events that result in flooding conditions. Armed with semi-permanent markers (e.g. spray paint cans), these staff would mark flood lines and record their date and location for subsequent survey by field survey crews. All such information would be entered into the digital database with the flood complaint records. Over time this database will prove invaluable to staff in the investigation of future problems and development of analytical tools based on real data from real storm events.

15.6.9 Public Relations and Educational Materials

To assist in its public relations efforts, it is recommended that Hillsborough County publish a series of fact sheets to explain complex technical concepts in common, plain, non-technical language. A fact sheet is a one-page pamphlet that articulates complex technical issues with plain language, photographs, graphics, and charts. Fact sheets would serve a number of purposes. They are an efficient way to communicate with a constituency and establish a standard organizational response to common questions. These responses would be valuable assets to County staff when made available at public meetings. Fact sheets are compact and easily updated. Hillsborough County might publish fact sheets to address the following topics and issues:

- Floods and Floodplains
- Flood Insurance
- Stormwater Best Management Practices
- The Hydrologic Cycle

- Flooding Level of Service
- The Hillsborough County Comprehensive Plan
- The Relationship between Floods, Habitat, Natural Systems, and Water Quality
- Water Supply
- Illicit Discharges
- Septic Tank Operation and Maintenance Practices
- Stormwater Pollutant Sources and Effects
- Exotic and Nuisance Plant Species Identification and Control
- Erosion and Sediment Control Practices
- Fertilizers, Herbicides, and Pesticides
- Xeriscaping
- Composting
- Household Hazardous Waste Disposal

These fact sheets could be made available on the County's Watershed Atlas (http://www.hillsborough.wateratlas.usf.edu/)

15.6.10 Digital Topographic Mapping

Over the duration of the study in developing the Alafia River Watershed Management Plan for Hillsborough County, analysis was severely hindered and limited due to the lack of current topographic mapping for much of the watershed. In most cases, Parsons used SWFWMD aerial topographic maps that are dated up to 30 years ago. This prohibited evaluations of flooding conditions in residential developments that are shown as undeveloped land on these maps. In some areas, there was no topographic coverage available at all. To provide the required mapping needed to conduct and administer its stormwater management program, it is recommended that Hillsborough County procure a complete digital 1-foot topographic elevation coverage for the entire County. Once this product is completed, it should be used as the basis for the County to develop current floodplain maps of the unincorporated Hillsborough County.

15.6.11 Agricultural Stormwater Management Practices

Agriculture comprises a significant portion of the land use, economy and culture in the Alafia River Watershed. Twenty-six percent of the land area in this watershed is categorized as cropland and pastureland. The impacts generated by agriculture to the watershed are also significant.

In west central Florida, an agriculturist will be required to obtain an Environmental Resource Permit (ERP) if they construct any new facilities that affect surface water flows or runoff, or if they plant crops in an area that contains wetlands. They may

also need an ERP as a condition for obtaining a Water Use Permit (WUP). Farms in existence prior to the Clean Water Act are exempt from stormwater permitting requirements. Passage of the Warren S. Henderson Wetlands Preservation Act in 1984 provided an exemption from stormwater permitting if a landowner produces a conservation plan. The conservation plan, known as a Resource Management System Conservation Plan (RMS) is the instrument for an ERP exemption. One drawback to this process is that once the exemption is issued, there is no inspection or enforcement to ensure compliance with the plan.

A RMS Conservation plan, often put together by technical teams at the Natural Resources Conservation Service (NRCS), considers many factors such as irrigation rates, nutrient and pest management, wetland buffers, and site specific Best Management Practices for stormwater management. The NRCS has several programs available to provide incentives and encourage landowners and farmers to install environmentally beneficial structural, vegetative, and management practices. These include the *Environmental Quality Incentive Program* (EQUIP), the *Agricultural Ground and Surface Water Management* program (AgSWM), and the *Wildlife Habitat Incentives Program* (WHIP), and cost-share programs.

It is evident when traveling through the watershed that these programs are not being implemented, or there are many, many "grandfathered" farms. Many fields are simply bare soil with plastic mulch draining to bare earth ditches along fields with no vegetative buffer, no tailwater recovery, settling pond, or other apparent Best Management Practice. These ditches drain directly to the constructed stormwater systems or the natural stream system.

The County needs to find ways to encourage the farming community to improve agricultural practices. One of these ways would be to form partnerships with the farm community and to build alliances that foster cost-effective, durable solutions to key problems. Solutions might include providing local incentives such as a cost-share program offering additional incentive to existing state and federal programs. Adding items of local importance to the docket of practices approved for cost-sharing would be another. Cost-share programs to control erosion and improve water quality offer many public benefits and would save local governments money over the long run by reducing expenditures on maintenance requirements such as removing sediment from ditches and repairing roads damaged by erosion or washouts.

Another possible incentive would be to offer flexible-term easement programs. A variety of easement terms are needed to fit the needs of many different types of landowners, i.e., permanent, long-term or short-term easements. Buffer areas with permanent easements could be reassessed to reduce property taxes. Tax rebates could be provided for those who donate a conservation easement beneficial to the County.

The County could form or sponsor partnerships of farmers, landowners, urban residents and representatives from public and private organizations who are concerned about the water quality and flood-related problems in the Alafia River Watershed or even subwatershed groups. The partnership would hold monthly meetings to disseminate information about the purpose of the partnership and to engage farmers, landowners and residents of the watershed in a series of discussions about water quality, wetlands and flood-related problems. As federal and state support for agricultural conservation programs are reduced, local governments need to find ways to step up and build public-private partnerships for agricultural conservation.

15.6.12 Revision of Hillsborough County Flood Level of Service Definitions

The flood level of service definitions contained within the Hillsborough County Comprehensive Plan are poorly defined and subject to a wide range of interpretation (e.g. “significant” road flooding, “significant” yard flooding, etc.). While there was an attempt to standardize the interpretation of the terms for use in this plan and the other watershed plans within the County, it still remains to be formally defined and revised within the Comprehensive Plan itself. It is recommended that more rigorous definitions be adopted and the four flooding LOS categories be further expanded to a matrix form. The four flooding levels of service could be defined (A, B, C, and D), each with a progressively greater depth of allowable flooding for a given type of facility (e.g. neighborhood road, arterial road, evacuation route, residential structure, parking lot, etc.) and flood return frequency. With this matrix approach, it will be much easier to assess the degree of flooding protection being provided at any point within the drainage system and assign one of the four LOS classifications.

An additional recommendation related to the County’s flooding level of service criteria is that of field survey of low floor slab elevations of residential and commercial structures in the key flooding problem areas identified within the County’s watershed studies. If, as recommended, the flooding LOS criteria are expressed as allowable depths of flooding for specific design storm event frequencies, depending on the location and type of facility being considered, it is important to know the critical low floor slab elevations within the areas of flooding concern to assure that the adopted flooding LOS will be met by the proposed capital improvement projects.

Parsons considers this to be a necessary element of the Level of Service (LOS) concept of stormwater management facility planning and design. For the Alafia River Watershed Management Plan, residential flooding (LOS D) was identified whenever the depth of flooding on the road exceeded 1.0 foot. While this is a reasonable assumption in the absence of any site-specific information, it is still an unsubstantiated indicator of structural flooding, and confirmation is necessary. Also, “significant yard flooding” is a nebulous concept that would best be eliminated from the County’s LOS definitions.

15.6.13 Stormwater Management Regulations for Closed Drainage Basins

It was noted over the course of investigations during the Alafia River Watershed Management Plan that a great number of the identified flooding problems that have been observed in recent years have been located within closed drainage basins. There is one notable region within the Alafia River Watershed that is mostly comprised of such closed basins. This region includes the Pemberton and Baker Creek Closed Subwatershed (located within the Turkey Creek Subwatershed for the purpose of this study), and adjacent basins to the immediate south. Large residential and commercial developments have been constructed within these basins in the past ten years, and there is continuing development pressure. While there are stormwater regulations in place specific to development within closed basins, it is apparent from observations in recent years of severe flooding problems that these regulations are not serving their intended purpose.

It is recommended that Hillsborough County adopt a more strict set of stormwater management regulations for development within closed drainage basins. The first step of this process would be to require the developer to provide evidence of drainage impacts for a distance downstream of the proposed development. With the completion of the County's watershed management plans, the County is now in the position of being able to provide the applicant the appropriate watershed modeling tool to make such assessments possible. If the development is determined to be contained within, or is in itself, a closed drainage basin, a stormwater retention storage volume must be required.

Because closed drainage basins are "volume sensitive", the basis for regulation of offsite impacts should be the most conservative 100-year storm event. Current regulations determine the required storage volume as the difference between the pre-development and post-development runoff volumes for the 100-year storm event. Where this practice seems to be failing is in the presumption that the required storage volume will actually be available when this theoretical event occurs. In a closed drainage basin, the stormwater runoff must either percolate or evaporate after each and every storm event, large or small. When a closed basin goes from an undeveloped to 30% directly connected impervious area condition, the annual volume of runoff that is generated can increase from an average of less than 5 inches to more than 18 inches per year. This is a drastic alteration of the hydrologic regime of the closed basin that results in elevated groundwater levels. Because of this, the rates of percolation in the constructed (and natural) storage areas are affected. The net result is that the retention storage ponds constructed with the new development are not percolating at a sufficient rate and storage is not available in them when needed for large storm events.

While the problem in these basins is evident, the solution is not. If development is to be allowed within existing closed basins, the County needs to require of the applicant a much more extensive analysis of the site-specific and regional hydrogeology. It is recommended that greater safety factors be required for percolation calculations and perhaps full retention of the 100-year storm event. Restrictions on development

densities within closed drainage basins would mitigate for some of the problems observed. Also, a common design practice is to provide the required retention storage volume within or adjacent to the existing natural depression or low point within the closed basin. It would greatly alleviate some of the observed problems if the required retention storage volume were to be provided on upland slopes, where groundwater table impacts would be less a factor.

15.6.14 Control of Nitrate Loadings from Lithia and Buckhorn Springs

Lithia and Buckhorn Springs discharge nitrate-rich waters into the Alafia River. The average nitrate concentrations of Lithia and Buckhorn Springs are 3.1 and 2.1 mg/l NO_3 (as N), respectively. The springs contribute approximately 157 tons of nitrate-nitrogen to the Alafia River annually, or about 22 percent of the nitrate-nitrogen contributed to Tampa Bay by the Alafia River (Jones and Upchurch, 1993).

These springs are especially vulnerable to pollution due to the absence of the Tampa clay within the recharge area (refer to Section 7.1). The Tampa clay typically separates the Intermediate and Floridan Aquifers in the region and its absence results in recharge directly to the Floridan Aquifer. For this reason, the springs are very susceptible to pollution resulting from land-based activities such as lawn and crop fertilizing and septic tank usage.

One alternative to reduce nitrate loads is source control, and management practices designed to address septic tank and fertilizer usage (below) are advisable. Alternatives that aim to remove the nitrate-rich water from the system should also be considered. Cargill Fertilizer, Inc. owns both springs and currently diverts approximately 14 percent of the flow to its chemical facility located near the mouth of the Alafia River. This diversion prevents about 26 tons of nitrate-nitrogen per year from reaching the Alafia River.

A feasibility study should be undertaken to determine the viability of water use alternatives that would divert the spring water for other uses. The feasibility study would identify potential uses and address the compatibility of the nitrate-rich water with its proposed uses, the impact of reduced freshwater flow (unless a “water replacement” alternative is used), and the costs verses the benefits. Alternatives could include a diversion to:

- Tampa Bay Water’s Regional Water Treatment Plant via the proposed pipeline from the Alafia River intake,
- Hillsborough County’s proposed reclaimed water line to supply water to Cargill
- A new potable or reclaimed water system for the Brandon Area, or
- Other industrial uses.

Significant flows originate from the springs. Lithia Springs yields approximately 47 cubic feet per second (cfs), and Buckhorn Springs produces about 18 cfs, on average (SWFWMD, 1992). The County should capitalize on the springs’ value as a water source to reduce the load of nitrate-nitrogen to the Alafia River.

15.6.15 Cattle Grazing Management Practices on ELAPP Lands

Currently, portions of three of the Hillsborough County ELAPP lands are leased for cattle grazing. The leases provide the County program with much-needed operational funds and reduce the need for mowing and management because the lessee assumes that responsibility. The leases are managed to avoid impacts to the natural systems and wildlife habitat by maintaining a very low density of cattle per acre, by limiting the cattle to lands that were previously used for grazing cattle, and by avoiding impacts to natural areas and wetlands by fencing. Water quality impacts are avoided by maintaining a fenced, well-vegetated buffer from all drainage areas. Water quality is monitored to ensure that no degradation occurs as a result of the grazing.

Cattle management on rangelands is in common usage by many landowners with large tracts, including environmental groups like The Nature Conservancy. The grazing cattle reduce the vegetative load, thereby reducing the necessity for mowing and the potential for wildfires. In addition, the cattle help keep the sites from becoming overrun with nuisance species until restoration can be initiated with native plant species. Without the cattle, these sites would require prescribed burns at least once a year. Prescribed burns are expensive, labor intensive, and are getting harder to permit due to recent accidental wildfires.

Currently the newly acquired parcel on Jameson Road near the South Prong is the only site within the Alafia River Watershed that supports cattle grazing. The cattle on this site are managed in the manner described above, with low cattle per acre densities, and buffers against sensitive areas. In the future, the County plans to restore the site to native habitat, but in the meantime, the cattle grazing will help preserve the site.

When grazing lands are improperly managed, cattle grazing can cause significant impacts to water quality. Pollutants in the cattle's feces could be transported by runoff to the Alafia River Watershed's waterways. Fecal contamination is a problem throughout the watershed, but the source of this contamination is not known. Cattle feces, a likely contributor, have a higher probability of containing human pathogens than do the feces of wild animals. All animal feces also contribute oxygen-demanding substances, nitrogen, phosphorus, and organic solids.

In order to preserve the wildlife habitat and prevent water quality degradation on County-controlled lands the management actions that should be maintained include:

- Removing cattle from ELAPP lands when habitat restoration is complete,
- Maintaining setbacks, buffers, and density restrictions, or
- Providing treatment for stormwater runoff from grazing lands.

These management measures would obviously be desirable for all cattle grazing areas, but at this time can only be required on County-controlled lands. The

management actions listed above have been implemented on all three ELAPP parcels.

15.6.16 Phosphate Mine Spill Containment/Prevention

Numerous unintentional releases of acidic and clay-settling pond waters have occurred in the Alafia Watershed over the years. The most recent major spill occurred in December 1997 when the wall of a phosphogypsum stack in Mulberry was breached. This spill sent about 50 million gallons of acidic process water into the Alafia River.

The most common cause of these spills has been failures of earthen dams. These failures result from poor construction or inadequate inspections and maintenance. The SWFWMD has proposed at number of measures aimed at reducing the likelihood or mitigating future spills these measures include:

- Disallowing decant pipes laid through impoundment dams and recommend siphon type decant pipes,
- Construct perimeter seepage/storage ditches around the perimeter that would contain the volume of process water atop the waste gypsum stack, or
- Study the feasibility of neutralizing future spills with lime sprayed into the spill front by emergency tankers.

It is recommended that Hillsborough County support these proposals and initiate a feasibility study to determine which of these, or other, solutions should be implemented.

Other potential solutions are a regional spill containment system or an emergency treatment system constructed along the river. A regional spill containment system would divert river water into a holding reservoir where the water would be treated and released back to the river. The emergency treatment system would consist of a chemical storage and injection facility that would treat the spill with calcium hydroxide. Each of these systems could be actuated from a remote location or automatically based on pH in the river. Both of these facilities would be costly and siting such a facility will require careful study.

15.6.17 Septic Tank Regulation

The use of septic tanks for sewage disposal is prevalent in the Alafia River Watershed, and sewer service in not available in much of the watershed (*Figure 7.3-5*). Septic tank effluent is a source of nitrogen, phosphorus, organic matter and bacterial and viral pathogens. Improper design or installation as well as neglectful operation compound the problem. Regular inspection and maintenance is necessary and often does not occur.

It is recommended that the County investigate management measures to reduce water quality impacts of septic tank usage. The county is currently compiling information concerning the locations of septic tanks, and this information will be very valuable in developing plans for improvement. Some of the management actions

that should be considered are central sewer systems, a pump-out ordinance, and inspections.

The feasibility of extending existing sewer service areas should be investigated. This feasibility analysis should include expanding the limits of service of existing wastewater treatment plants as well consideration for new treatment facilities. In sensitive areas, such as the *Brandon Karst Terrain* (Section 7.1), perhaps the availability of central sewer should be a concurrency requirement for new development. Due to low population densities in many parts of the watershed, complete elimination of septic tanks within the watershed is not likely. For this reason, management measures aimed at reducing the water quality impacts of septic tank use are needed.

Perhaps a "pump-out" ordinance could be enacted. This ordinance would require septic tank owners to clean out septic tanks. Five years should be a fair and effective "pump-out" interval. Evidence of compliance could be supplied through a self-reporting process or a record-keeping requirement for business providing "pump-out" services.

Inspections of new and existing systems should take place for design, construction and drain field adequacy. During the third public meeting it was reported that pipes draining septic tanks directly into the river have been observed. This particular location was in the canal that connects to the south side of the Alafia River just west of the Magnolia Drive vicinity. This and other types of deficiencies could be uncovered by inspections.

Individual residences are not the only locations where underground disposal of effluent occurs in the watershed. Riverwalk Village Trailer Park treats the park's wastewater onsite and disposes of the effluent by exfiltration. An onsite ditch was observed flowing during dry weather and nearby residents have reported seeing feces in the embayment south of Magnolia Drive. All facilities providing onsite sewage disposal should be inspected and a designated person (possibly the *River Keeper*, see below) should request to receive all discharge monitoring reports (DMRs), operating permit renewals, and other regulatory correspondence. These facilities are subject to inspection by FDEP's Compliance Enforcement Division; however, the frequency of these inspections is low due to staff limitations.

15.6.18 Septage Disposal Practices

Several areas within the watershed are used for disposal of septage from septic tank pump-out tanker trucks (refer to Section 7.3.2). This practice is a concern because of the potential for pollutants contained in the septage to be released to the environment. Several years ago the County was considering a plan to provide treatment for the septage at one of its wastewater treatment plants. This plan should again receive consideration and existing regulations and enforcement practices that govern this activity should be reviewed.

For the most part, these sites are privately owned agricultural lands. The septage has value as a fertilizer; therefore, landowners either pay to have the waste delivered or simply grant permission to disposal companies to spread the waste on their land. This waste originates from pumped-out septic tanks.

This activity can impact surface water runoff quality as well as ground water due to high concentrations of nutrients, trace metals, and organic compounds. The primary controlling factor appears to be presence or lack of runoff controls in the case of impacted runoff, and the application rate in the case of potential groundwater contamination (Johnson, 1979).

Septage spreading is regulated by the Florida Department of Health. Pretreatment regulations are in force to reduce the potential for adverse impacts and setback requirements are in place to address the issue of stormwater runoff. Pretreatment involves screening for solids and stabilizing with lime. Setbacks are imposed on a sliding scale depending on site location and conditions ranging from 75 feet for drainage ditches to 3000 feet to Class I waters.

The Hillsborough County Water Department has investigated the feasibility of accepting 100 percent of the county's septage at wastewater treatment plants (WWTP's). The water department estimates that the capacity to dispose of 180,000 gallons of septage per day is needed to serve the needs of the entire county. The capital cost of WWTP improvements needed to accept the septage was estimated at $4.6 million. Operating costs are estimated at $80 per 1,000 gallons and three new employees would be needed. Public meetings were held in 1998 and the issue of discontinuing septage spreading in Hillsborough County is still under consideration.

The proposal to cease this practice should be revived – especially if monitoring results (refer to Section 15.4) support the notion that this practice contributes significant quantities of pollution. If this practice continues, perhaps, the County should consider disallowing this activity in certain sensitive areas such as the Brandon Karst Terrain. The County should also coordinate with the Florida Department of Health to ensure that each facility is inspected for compliance with setback and application requirements.

15.6.19 Alafia River Watershed "River Keeper"

A great deal of the many problems that have been identified over the course of the Alafia River Watershed Management Plan could be addressed within the existing regulatory and government services framework if there were an adequate inspection and monitoring program, and a central authority to coordinate activities within the watershed. For this purpose, it is recommended that a new county-staffed position be created for an Alafia River Watershed "River Keeper". This position, ideally filled by an engineer or biologist, would consist of part field inspection and monitoring, and part office work directed at discovering and solving flooding, water quality and

environmental problems within the Alafia River Watershed. This County employee would serve as both advocate and technical resource to facilitate watershed improvements. A potential mission statement for this individual could be "*To gain knowledge and stay current on issues affecting the watershed and seek solutions to the environmental threats and problems facing the Alafia River Watershed*." The "River Keeper" would also be responsible for inspections geared toward compliance with "self-policing" or "self-reporting" elements of EPA programs such as NPDES for Stormwater Associated with Industrial Activity (including the "light industry" exclusion), SARA Title III, and SPCC.

15.6.20 Public Awareness and Involvement Programs

An essential component of any watershed management plan is a focused and integrated public education and involvement program. Many agencies, both public and private, have information for homeowners regarding practices that can be implemented at the individual home level for the benefit of the local environment. Most residents, when educated regarding their immediate environment, become interested in acting more responsibly. The County's Watershed Atlas (http://www.hillsborough.wateratlas.usf.edu/) could be used as a clearinghouse for information concerning public awareness and involvement programs. The following recommendations are directed at increasing public awareness and involvement.

Watershed and Stream Crossing Signage

Hillsborough County should consider installing signs at stream crossings and at the Alafia River Watershed boundaries. These signs will foster stewardship by helping the public to identify with the streams and watershed in which they live or visit and to understand the far-reaching consequences of actions that degrade water quality in these waterbodies.

Storm Drain Marking Program

A storm drain marking program for the Alafia River Watershed is recommended. This program enlightens citizens about the potential adverse effects of stormwater runoff entering surface water bodies. Many people allow paint, petroleum products and yard wastes to wash into gutters and into storm drains without consideration of the effects on surface waters from these substances. The storm drain marking program involves simply painting legible messages on the drains to remind the public where the drains lead. Within the Alafia River Watershed, the messages may read "NO DUMPING - DRAINS TO TAMPA BAY," or "DUMPING HERE POLLUTES THE ALAFIA RIVER". Some of the messages may include illustrations of fish or wading birds.

The storm drain marking program has been successfully implemented within many areas throughout the country, and could be implemented within the Alafia River Watershed without significant expense. Volunteers from local schools and civic groups could be organized to conduct the marking under the supervision of officials from the County. Items needed for the drain marking include traffic cones, a broom,

paint, safety vests, instruction sheets, and stencils. These items can be purchased or fabricated.

Proper Use of Pesticides and Fertilizers

Pesticides. Pesticides are applied to control pest species, usually by reducing the population to an acceptable level. This objective can sometimes be achieved without damage to non-target species; however, when pesticides are broadcast over lawns and fields, a variety of onsite non-target organisms are impacted. In addition, much of the sprayed pesticide invariably drifts away from the intended site and deposits in non-target organisms and ecosystems. Many pesticides are not thoroughly tested prior to distribution and long term effects are not determined until too late. The pesticide DDT is a well-known example. Although the use of DDT was banned in the United States over twenty-five years ago, there are several sites within Tampa Bay where sediment concentrations exceed the No Observable Effects Level (NOEL) (TBNEP 1996).

A preferable alternative to pesticide use is integrated pest management (IPM). Within the context of IPM, acceptable pest control is achieved by employing an array of complementary approaches. They can include:

- The use of natural predators, parasites, and other biological controls.
- The use of pest resistant varieties of turf grass and landscape plants. Native plant species are frequently more resistant to pests and pathogens.
- The modification of environmental conditions so as to reduce the optimality of the pest habitat. This would entail not planting monocultures of specific plants.
- Careful monitoring of pest abundance, and using pest-specific, less toxic pesticides such as *Bacillus thuringensis.*
- The use of pesticides only when they are required as a specific component of the IPM.

Information regarding insect pests, the proper use of pesticides and IPM is available at the Hillsborough County Cooperative Extension Service.

Fertilizers. Many homeowners use too much fertilizer in their landscapes. Over-fertilizing actually encourages certain insects and diseases and increases maintenance needs. When shopping for fertilizers, homeowners need to request products that contain nutrients in water-insoluble or controlled release form. These fertilizers dissolve slowly, reducing the nutrients in stormwater runoff. The Hillsborough County Cooperative Extension Service has free information regarding

the most environmentally friendly fertilizers to purchase, and how they should be applied.

15.6.21 Low- Impact Development

Impacts due to urbanization alter watershed hydrology by increasing the quantity and degrading the quality of stormwater runoff to receiving waters. While conventional stormwater management practices are designed to mitigate the adverse effects of urban development, these measures can exhibit problems such as elevated water temperatures and accelerated stream erosion. Cumulative and compounding impacts of conventional development and stormwater management practices may fundamentally alter a watershed's hydrologic regime and water quality.

Low-Impact Development (LID) combines hydrologically functional site design with pollution prevention measures. The goal of LID is to maintain predevelopment runoff conditions. Stormwater is managed in small, cost effective landscape features on each lot, providing source control rather than end-of-pipe treatment. With this approach, hydrologic functions such as infiltration, frequency and volume discharge, and groundwater recharge can be maximized. Other techniques include lengthening flow paths and runoff times, and preservation and protection of environmentally sensitive features such as riparian buffers, floodplains, wetlands, and highly permeable soils.

Typical measures for LID include reduction of impervious surfaces, functional grading, open channel sections, disconnections, utilization of runoff, and the use of bioretention/filtration landscape areas. Low-impact development techniques integrate stormwater controls throughout the site in small, discrete units. In this way a centralized BMP facility is replaced by the use of microscale controls that are distributed throughout the site.

The basic precepts of Low Impact Development are to promote development site design techniques, strategies, systems, and criteria to store, infiltrate, evaporate, retain, and detain runoff on the site so that predevelopment hydrologic characteristics are maintained. It is possible to create stormwater control mechanisms on site that function in a similar manner to natural control mechanisms. Ultimately the beneficiaries of the LID approach are the receiving waters that will experience less change in volume, frequency, or quality of runoff. Groundwater base flows are also enhanced with this approach. While not all sites are suitable for LID, in general LID measures are more cost effective and require less maintenance than conventional, structural stormwater controls.

It is recommended that Hillsborough County engage in the Low-Impact Development approach for all County projects and encourage the use of this paradigm by private developers as well. The County might review regulations and ordinances to encourage flexibility and provide incentives to implement innovative engineering and site planning. A program for public outreach and education is recommended.

15.7 NATURAL SYSTEMS RECOMMENDATIONS

15.7.1 Stream Corridor and Wetland Buffers

In the context of this study, wetland buffers are those vegetated areas bordering wetlands and protecting them from impacts to water quality and wildlife habitat. Vegetated buffers filter surface water runoff, removing particulates and other debris before it discharges into the wetland. Under certain conditions, a wetland buffer may also remove metals, pathogens, and other pollutants in surface water runoff. Buffers can reduce water temperature by providing shade, and can reduce the impacts of humans on wetlands by minimizing the edge effects from noise and light. Wetland buffers can also act as barriers against the invasion of nuisance and exotic species.

Buffers also provide wildlife habitat. Wildlife corridors are essential for migration, genetic exchange, and the basic survival needs of wildlife, and most corridors are located along rivers, streams, or other wetland systems. These buffers typically support a higher species diversity than the adjacent habitat (Brown 1987).

The optimal width of the buffer depends on expectations. Castelle et al (1994) determined that for sediment removal, the optimal widths ranged from 10 to 60 meters. For the removal of nutrients and metals, widths of 4 to 85 meters were found to be functional. Species distribution and habitat diversity are enhanced by buffer widths from 3 to 110 meters, depending upon the species. Castelle et al found that buffers less than 5 to 10 meters provide little protection under most conditions, and recommend minimum buffer widths of 15 to 30 meters.

The Environmental Protection Commission of Hillsborough County requires a 30-foot buffer from areas they claim as jurisdictional wetlands. This is less than the recommended minimum 50 foot buffer for water quality protection (Davis 1993), but significantly higher than the 15 foot buffer required by the other state regulatory agencies. This buffer may sometimes be altered as necessary by the landowner, with fencing, mowing, and other unbeneficial impacts, but no impervious surfaces may be placed in the buffer without an application to the County's Planning and Growth Management Department Variance Review Board. With sufficient justification, certain waivers of the setback may be permitted.

Recommendations

Based upon the information above, and past experience in Hillsborough County, a standard buffer of 50 feet is recommended for all wetlands in Hillsborough County. Certain exceptions may apply, such as in highly developed areas where imposing a 50-foot buffer would potentially cause a hardship, and where the existing conditions do not provide riparian habitat. In some cases, it would be appropriate to waive the need for a buffer in one area, but require mitigation for the habitat loss by creating a wider buffer in another area. Or, in areas where the existing habitat is especially depauperate, a 30-foot buffer may be allowed but as compensation for the variance,

the installation of trees, shrubs and herbaceous species within the 30-foot buffer would be required. The 50-foot buffer has been proposed in Hillsborough County previously but was not approved for adoption.

15.7.2 Exotic Species Management Plan

The proliferation of exotic plants and animals has reached epidemic proportions throughout the world and efforts to control the epidemic are costing billions of dollars annually. The problem is so serious in the United States that in February 1999, President Clinton issued Executive Order 13112, creating the Invasive Species Council. This council's duty is to oversee the implementation of this EO, to produce an Invasive Species Management Plan, and to encourage planning and action at local, state, regional, and global levels. Most of the exotic plant controls that have been initiated to date were concentrated on aquatic weeds and those plants that threatened agricultural areas, but the new initiative includes invasive plants that are threatening native habitats and the survival of endangered and threatened species.

Invasive exotic species have been a problem in the Alafia River Watershed since the turn of the century. Exotic aquatic vegetation chokes drainage waterways, impedes boat traffic and contributes to water quality problems. The upland exotic species displace native species and cause wildlife habitat degradation. Over 100 aggressive exotic plant species, most of them imported for ornamental or agricultural purposes, have escaped from cultivation and are competing with native species for nutrients, water, sunlight, and space (Kline and Duquesnel 1996).

Nuisance exotic species are successful due to their fast rate of growth, prolific seed production, and long-range unspecific seed dispersal mechanisms. Early successional stage plants from areas with similar climates are the most likely plant species to become invasive in Florida. These plants can displace entire native communities when they become established in an area away from the influence of the diseases and predators of their native habitat.

Purpose of the Management Plan. Hillsborough County and various other local, state, and federal entities are all involved to various degrees in the effort to manage the invasive plants in the area. The purpose of the Exotic Species Management Plan is to identify those areas that require the most attention and to identify the facilities available so that efforts can be prioritized and coordinated. This plan also provides recommendations to reduce or avoid the duplication of efforts, so that the funds spent on the eradication activity can be used cooperatively, to the best advantage.

Existing Conditions. In order to determine the extent of the nuisance species infestations and the species present, some preliminary mapping was conducted in the field. In addition, input was requested from the Resource Management Department of Hillsborough County, and the National Audubon Society. The scope of this project necessitates that only the major infestations or monocultures of nuisance species be mapped and discussed. Many areas have nuisance species

mixed in with native species, but the exotic species are not the dominant cover component. This is often the case with such species as the tropical soda apple, sword fern, and the climbing ferns.

In other areas the infestation may be a seasonal problem. Some of the noxious vines become dormant in the winter or after a freeze, but come back stronger the following year. Air potato, the climbing ferns, and rosary pea are examples of this type of vine. The dead vines left on the tree after a dormant season can act as a fire ladder, allowing fire to access the crown of a tree and kill it. This can result in a catastrophic fire where under natural circumstances, a low, less damaging ground fire may have occurred.

The dominant problem species in the Alafia Watershed are listed in the following table. The list provided in Appendix B lists all the nuisance species found within the watershed, including those that are not yet presenting a problem. The list below includes aquatic and terrestrial species, as identified by the maintenance agencies and the natural resource personnel. Some species that were mentioned by the County natural resource stall, such as *Lantana camara, Yucca aloifolia, Washingtonia robusta, Parkinsonia aculeata*, and *Cinnamomum camphora*, were not included on this list because they are not significantly invasive in this area. Some of the species on the list are problems only in certain areas, such as the *Sapium sebiferum*, which is a problem on reclaimed mine land north of SR 60. Kudzu (*Pueraria lobata*) is also a problem in this area, but it has not yet escaped to other areas within the watershed

Maintenance Agencies and Volunteer Groups

There are numerous federal, state, local and regional agencies that have one or more divisions or sections involved to some degree in the eradication of nuisance species in the Alafia River Watershed. There are also several local volunteer groups that have been successful in the maintenance of nuisance species. Table 8.2-2 lists the entity, the lead or contact person, the type of activity the entity is involved in, and the target species. The following paragraphs provide additional information regarding these entities.

Dominant Exotic Plant Species Found in the Alafia River Watershed		
Scientific Name	Common Name	Estimated Level of Problem
Abrus precatorius	Rosary pea	Minor
Albizia julibrissin	Mimosa tree	Minor
Albizia lebbeck	Woman's tongue	Moderate
Casuarina equisetifolia	Australian pine	Major
Colocasia esculenta	Wild taro	Moderate
Dioscorea bulbifera	Air potato	Major
Eichhornia crassipes	Water hyacinth	Major
Hydrilla verticillata	Hydrilla	Moderate
Imperata cylindrica	Cogon grass	Major
Ipomea aquatica	Water spinach	Minor
Ludwigia peruviana	Primrose willow	Major
Lygodium japonica	Japanese climbing fern	Moderate
Melaleuca quinquenervia	Melaleuca	Moderate
Melia azedarach	China berry	Minor
Nephrolepis cordifolia	Sword fern	Moderate
Paederia foetida	Skunk vine	Major
Panicum repens	Torpedo grass	Major
Pennisetum purpureum	Napier grass	Moderate
Pistia stratioles	Water lettuce	Moderate
Pueraria lobata	Kudzu vine	Minor
Ruella brittonia	Mexican petunia	Moderate
Sapium sebiferum	Chinese tallow	Moderate
Schinus terebinthifolius	Brazilian pepper	Major
Solanum tampicense	Aquatic soda apple	Moderate
Solanum viarum	Tropical soda apple	Major
Typha sp.	Cattail	Moderate
Urena lobata	Caesar weed	Moderate

U. S. Army Corps of Engineers: The Headquarters of the U. S. Army of Engineers (USACE) established the Aquatic Plant Control Operations Support Center (APCOSC) within the Jacksonville District to serve as the Corps-wide center of expertise in the operational aspects of aquatic plant management. The knowledge and expertise of the APCOSC staff, gained through the administration of the largest and most diverse aquatic plant management program within the Corps, enables APCOSC personnel to professionally execute the mission of assisting our customers in the planning and operational phases of aquatic plant management activities.

The APCOSC serves as a consultant on invasive plant issues and furnishes technical expertise, and/or personnel and equipment to respond to emergency situations caused by excess accumulations of aquatic nuisance vegetation around the country. The staff also serves as a national contact and distribution center for the exchange of information and technology with other federal agencies, as well as state and local agencies. Public outreach and education are also important parts of the programs provided by the Center.

In Florida, the APCOSC has worked with the Florida Game and Freshwater Fish Commission to control water hyacinth, and with the South Florida Water Management District to control melaleuca. They have not participated in nuisance species eradication efforts in the Alafia River Watershed to date, but this organization is available for information and potentially for assistance.

Florida Department of Environmental Protection: The Florida Department of Environmental Protection (FDEP) has several different entities within the agency that are involved with nuisance species eradication. The Upland Invasive Plant Management program was established under Florida Statute (F.S. 369.252) to address a statewide, coordinated, ecosystem management approach to the upland invasive plant problem. This section established eleven Regional Invasive Plant Working Groups to select projects on public lands for upland invasive plant management at a local level.

The FDEP also maintains the Bureau of Invasive Plants. This agency has, until recently, concentrated on the maintenance of aquatic plants, and this is still true with the local office. Until the local office receives additional staff and funding, the focus on the maintenance of aquatic plants will not likely change.

The Southwest Florida Water Management District: The Operations Section of the SWFWMD has a field maintenance group that is responsible for the maintenance of culverts and roadways on District lands and drainage rights-of-way. This group routinely uses a hydro-ax, which is very efficient in the removal of woody nuisance species such as Brazilian pepper, Australian pine, and melaleuca. This group also conducts controlled burns and herbicide spray efforts. This group is in great demand and can only assist on non-District lands when scheduling permits.

Hillsborough County: Hillsborough County has an exotic species maintenance plan that is managed by the Mosquito and Aquatic Weed Control section of the Road and Street Maintenance Division of the Engineering Department. This unit controls pestiferous and disease-transmitting mosquitoes by spraying for larvae and adult mosquitoes with ground equipment and aircraft. The plan for the Alafia River Watershed that is officially permitted by the EPCHC provides a map of the areas sprayed and lists the cost and substances used to control. The target species include hydrilla, water hyacinth, water lettuce, pennywort, cattails, primrose willow, and algae. The majority of the spraying within the Alafia River Watershed occurs in Lake Grady and around the boat ramps in the Alafia River. The areas targeted for spraying are indicated on the attached map. No control for upland species or biological control is described in the permit.

This unit of the Hillsborough County government also coordinates continually with University of Florida entomologists to establish biological controls. There are currently tests being conducted for natural controls for melaleuca and Brazilian pepper. Previous tests have been conducted to find natural predators for alligator weed and hydrilla, and have met with some success.

The ELAPP Natural Resource Department has a “spray staff” and equipment for treating nuisance exotic species. The staff is headquartered in Cockroach Bay and consists of two permanent people and 3 to 4 “limited duration” workers. This group only works on County-owned property or property that is jointly owned by the County and SWFWMD, and the majority of the work is funded by grants obtained year-to-year from the Alafia River Basin Board. Currently this group is working on the Balm-Boyette Scrub, Alafia River Corridor Area, and Alderman’s Ford Addition. The exotic species they concentrate on in these areas are the tropical soda apple, skunk vine, cogon grass, and air potato.

Contractors hired by Suncoast Aquatic Plant Working Group of the FDEP are currently working on the old phosphate mine area in the Alderman’s Ford Addition property. The nuisance species this group is working on are skunk vine and Japanese climbing fern. These contractors are one of four groups in the entire state that specialize in upland nuisance species eradication.

The Pepper Patrol: The Pepper Patrol is a group of citizens from Ruskin, Florida that have been very helpful in eradicating nuisance vegetation in that area, but have not yet been involved in nuisance species removal in the Alafia River Watershed. They typically only work in the winter and may be available for small sites.

AmeriCorps: AmeriCorps National Civilian Community Corps is an organization that that functions like a domestic Peace Corps, assisting public and non-profit groups in environmental and civic enhancement projects. In 1998, a group of college students and other young people from Charleston, South Carolina spent several months in the Cockroach Bay area clearing nuisance vegetation, planting native

vegetation, marking trails, and other tasks. According to Richard Sullivan, the preserve manager, this group was very competent and was able to work without a lot of supervision. Brandt Henningsen and Forrest Turbeville of the SWFWMD coordinated the AmeriCorps volunteers.

15.7.3 Wetland Planting Guide

This guide is provided as a planting aid to land owners living on lakes, ponds, streams or other wetland systems. The benefits of native plantings within and around wetlands are numerous and well documented. These benefits include:

- Erosion protection
- Water quality improvement
- Wildlife habitat
- Aesthetics

The following guide provides suggestions for the most beneficial species to plant, where to plant them, and what to expect from the plantings.

Erosion Protection

It is commonly known that unprotected slopes will erode when exposed to the effects of wind and water. This leads to loss of land mass, degradation of water quality, and the destruction of habitat due to sedimentation. Slopes can be protected by mulch or fabric, but the most effective way to stop erosion is to install native plants that will form dense masses of roots or stems that will hold the soil together during the heaviest rains.



Cord grass (*Spartina bakeri*), shown at the right, is an excellent choice for planting at the normal water level and higher. The grass forms large graceful clumps that can be cut down during the dry season to regenerate in the summer. The grass can withstand inundation for short periods of time, and is excellent at filtering stormwater runoff. The fruits of this grass species are also a staple in the diets of many ducks, especially mallards, and are also eaten by deer, rabbits, alligators, and other birds. (Ramey 1999)



A variety of sedges and rushes can also be used on the banks and shorelines of wetlands to prevent erosion. The giant and soft-stemmed bulrushes (*Scirpus validus* and *S. californicus)* are excellent choices for erosion protection in areas that may experience wakes from boats, like along the Alafia River. The plant mass of the bulrush can diminish the effects of boat wakes by diffusing the wave action. These rushes also tolerate brackish water and are excellent foraging material for many species of ducks. These two bulrush species will tolerate water depths ranging from 0.5 feet to 3 feet and are also excellent in filtering pollutants from surface water runoff.

Trees and shrubs can also be beneficial in protecting against erosion in areas with significant wave action, such as the lower Alafia River. Species that would be appropriate include bald cypress (*Taxodium disticum*), and buttonbush (*Cephalanthus occidentalis*). These species have root systems that can withstand some wave energy, but wave breaks would be beneficial in especially high-energy areas.

Water Quality Improvement

Wetland plants strongly influence water chemistry, acting as both nutrient sinks through uptake, and as nutrient pumps, moving compounds from the substrate into the water column. Their ability to improve water quality through the uptake of nutrients, metals, and other contaminants is well known (Cronk and Fennessy 2001). Emergent herbaceous aquatic species are more effective that floating species like water lilies, which can only absorb nutrients that are in the water column. Some species commonly used in wetlands especially designed for wastewater treatment are not appropriate for this use in Florida because they have escaped from cultivation and have become invasive in native habitats. Examples of this situation include cattail (*Typha* sp.), water hyacinth (*Eichhornia crassipes*), and elephant grass

(*Pennisetum purpureum*), which are serious nuisance problems in this area. Species that have been proven to be effective and would be appropriate in Florida include:

Arrowhead (*Sagittaria lancifolia)*
Soft rush (*Juncus effusus*)
Pickerelweed (*Pontederia cordata*)
Bulrush (*Scirpus* sp.)
Arrowroot (*Thalia geniculata*)



Of the species listed above, the arrowhead and pickerelweed would not be appropriate for areas with a lot of wave action, such as along the banks of the lower Alafia River. The blue flowered plant to the right is pickerelweed and the single white flower is arrowhead. These two species are best planted in ponds and freshwater marshes where they may form large monocultures and provide excellent nesting and foraging habitat.

Wildlife Habitat

Vegetation can improve wetland wildlife habitat in several different ways. In some cases, wetland plants can be a primary food source. As mentioned previously, many wetland grasses, sedges and rushes comprise the main diet for many waterfowl, as much as 90% of a mallard duck's diet. Wetland plants can also provide an attractant for prey species. An example of this would be the planted littoral shelves that provide nursery areas for young



fish, reptile, and amphibian species. These littoral shelf areas are primary foraging areas for many animals higher in the food web, such as wading birds and small mammals. Wetland plantings also provide nesting areas for many animals. These benefits, combined with the water quality benefits, make the planting of wetlands of significant importance to all types of wildlife.

Aesthetics

While some people may enjoy the sterile, manicured look of the water features on golf courses, most people prefer to see healthy, productive wetlands teeming with wildlife. Flowering plants such as pickerelweed, arrowhead, swamp lily, spatterdock, and arrowroot can be planted to provide color. Planted wetlands generally require less maintenance than unplanted wetlands because of the water quality protection they provide.


Airboat in the spatterdock
Nuphar advena
Photo by Vic Ramey
Copyright 2000 Univ. Florida

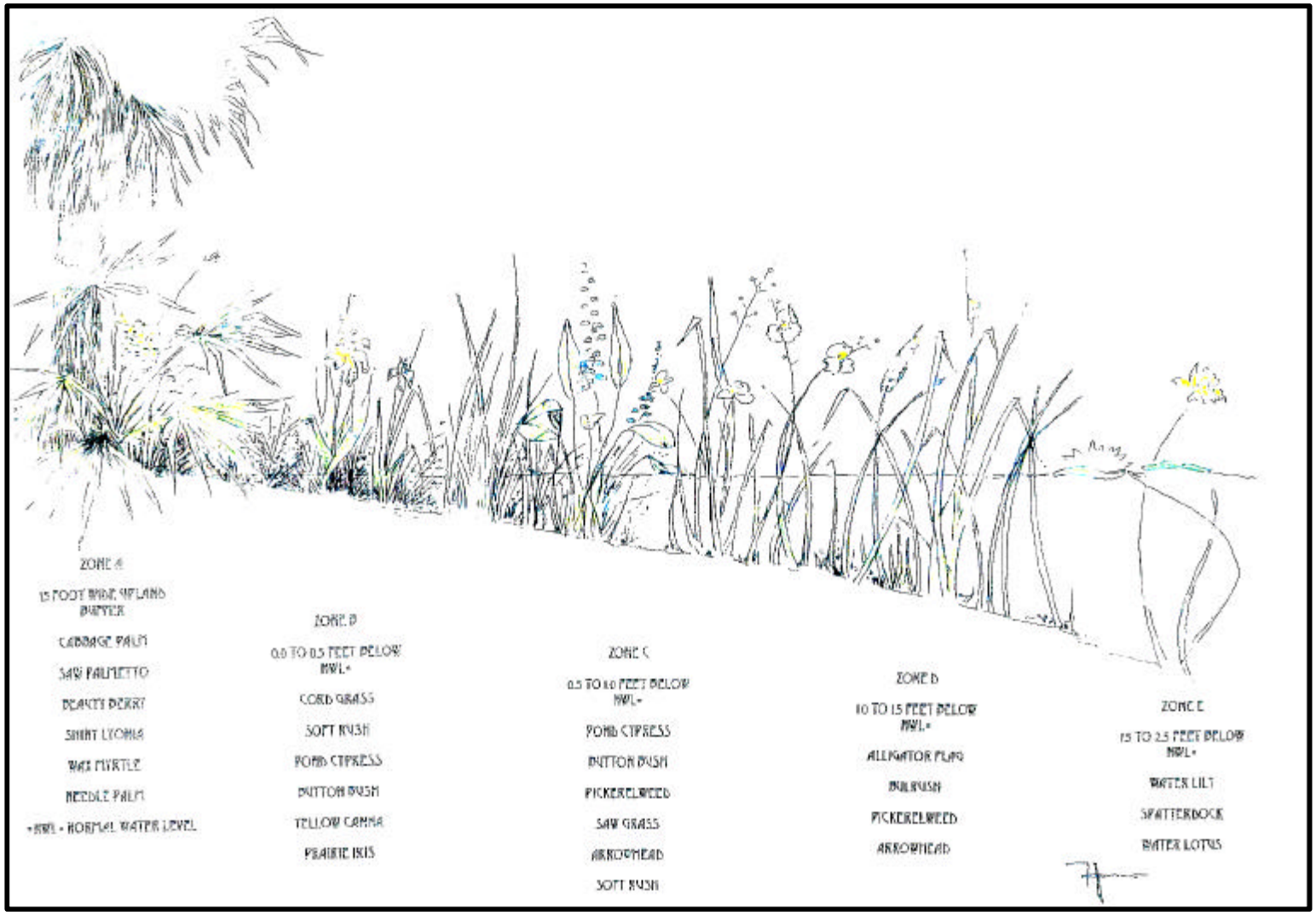
Summary

Wetland plantings benefit wetlands by protecting water quality, preventing erosion, providing wildlife habitat, and improving the aesthetics of our surroundings. Installing wetland plants can be virtually free if one takes advantage of one of the many programs around that will supply plants, and if the labor is provided by the homeowner. The Adopt-a-Pond program managed by the County may have information regarding sources for free plants. With permission, wetland species can also be carefully harvested from public or private lands. Harvesting must be conducted by experienced personnel to ensure the survival of the plants. And finally, wetland plants can be purchased from growers and nurserymen for relatively little money. Plants can be installed one foot apart for rapid cover, but plants installed three feet apart will fill in within one season under optimal conditions. A list of species and the recommended depths for planting is provided on the following page, as well as a figure describing a planted littoral shelf. More information can be obtained from the Southwest Florida Water Management District, the Hillsborough

County Cooperative Extension Service, or from the University of Florida IFAS Center (http://aquat1.ifas.ufl.edu/welcome.html).

WETLAND VEGETATION RECOMMENDED FOR PLANTING IN THE ALAFIA RIVER WATERSHED					
		PLANTING ELEVATION (IN FEET TO NWL)			
COMMON NAME	BOTANICAL NAME	0.0 to -0.5	-0.5 to -1.0	-1.0 to -2.5	> -2.5
TREES					
Red maple	*Acer rubrum*	X			
Water hickory	*Carya aquatica*	X			
Pop ash	*Fraxinus caroliniana*		X		
Loblolly bay	*Gordonia lasianthus*	X			
Swamp tupelo	*Nyssa sylvatica var. biflora*	X	X		
Sweet bay	*Magnolia virginiana*	X			
Cypress	*Taxodium spp.*	X	X		
SHRUBS					
Button bush	*Cephalanthus occidentalis*	X	X		
Virginia willow	*Itea virginica*	X	X		
Fetterbush	*Lyonia lucida*	X			
FORBS					
Water hyssop	*Bacopa caroliniana*	X			
Water hyssop	*Bacopa monnieri*	X			
Swamp fern	*Blechnum serrulatum*	X			
Yellow canna	*Canna flaccida*	X	X		
Saw grass	*Cladium jamaicense*	X	X		
String lily	*Crinum americanum*	X			
Spikerush	*Eleocharis baldwinii*	X			
Spikerush	*Eleocharis flavescens*	X			
Prairie iris	*Iris hexagona*	X			
Soft rush	*Juncus effusus*	X	X		
Black rush	*Juncus roemerianus*	X	X		
Redroot	*Lachnanthes caroliniana*	X			
Spatterdock	*Nuphar lutea*				X
Water lily	*Nymphaea odorata*				X
Pickerelweed	*Pontederia cordata*	X	X	X	
Arrowhead	*Sagittaria lancifolia*		X	X	
Bulrush	*Scirpus validus*		X	X	X
Giant bulrush	*Scirpus californicus*		X	X	X
Alligator flag	*Thalia geniculata*		X	X	

Example of a Planted Littoral Shelf



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CHAPTER 16

PUBLIC MEETING NUMBER 3

Hillsborough County held three public meetings to provide the residents of the watershed an opportunity to provide input to the process of developing the Alafia River Watershed Management Plan. At the first meeting the County asked that the residents provide information regarding what they thought were the problems in the watershed with respect to stormwater, and what existing conditions should be addressed. During that meeting, residents described roadway and yard flooding problems, lack of maintenance of existing drainage systems, water quality degradation, and other issues. At the second meeting, Parsons and the County presented potential solutions to the problems identified in the first meeting, and solicited additional comments. Those comments were used to develop a range of alternative solutions to the problems. The purpose of the third public was to present the alternatives to the public and solicit comments. This chapter describes the format of the third meeting and addresses the comments received.

Public Meeting Format

The third public meeting was held on November 15, 2001 at the Riverview Elementary School on Hannaway Road. Mr. Martin Montalvo (Hillsborough County) provides a brief introduction to the project and Mr. David Jones (Parsons) gave a video presentation of the problems that can be incurred if stormwater runoff is not managed properly, and the benefits of preparing a stormwater management plan.

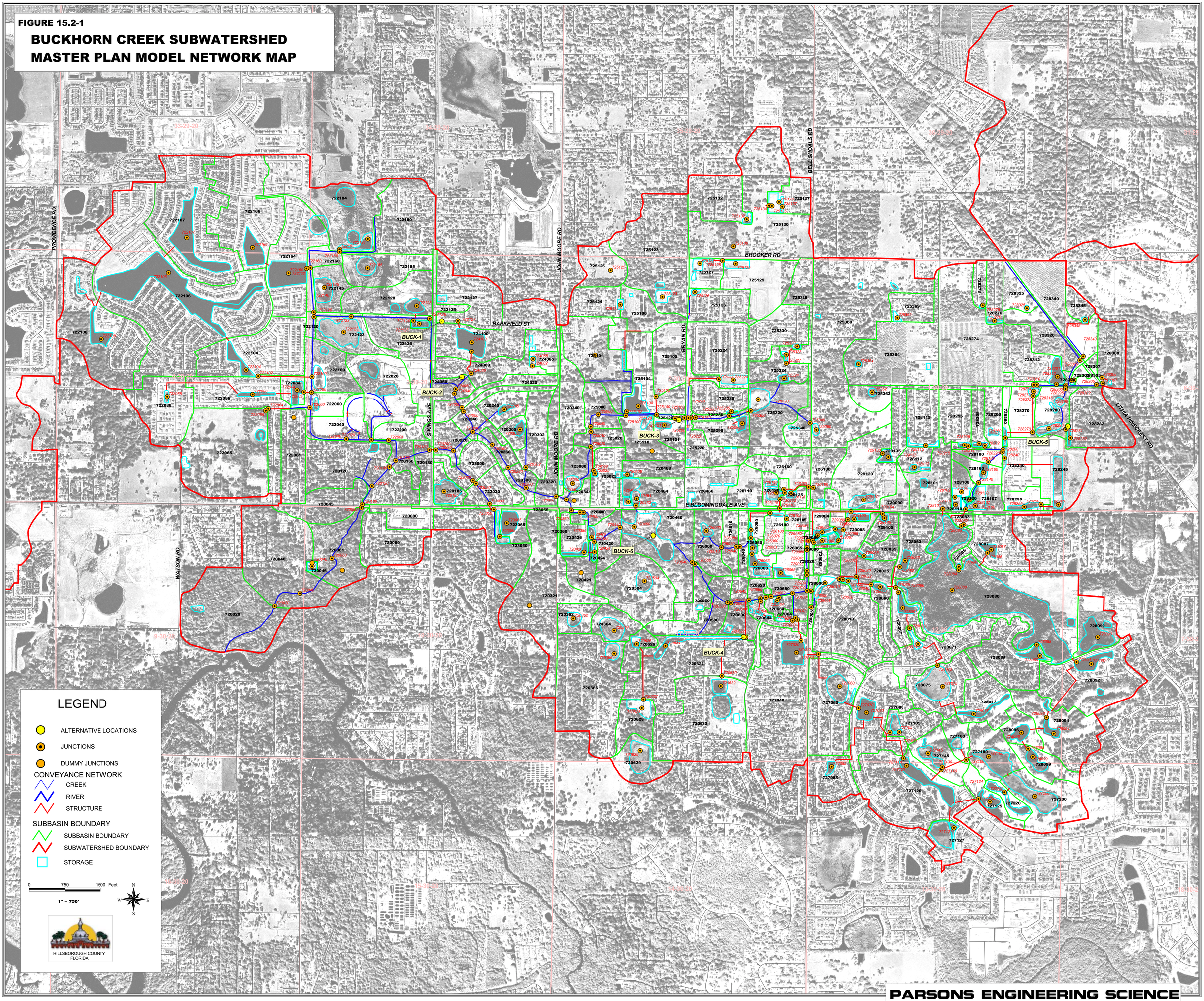
After the introduction, the attendees were requested to meet with the Parsons and County staff members present at the meeting, review the exhibits provided and submit questions or comments to the staff. The staff members present represented the three main elements of the Alafia River Watershed Management Plan; Flood Control, Water Quality, and Natural Systems. The locations of the proposed alternatives were displayed on aerial photographs for orientation, and a set of notebooks was available that provided more detailed views and descriptions. In addition, a Geographic Information System (GIS) station was set up so that the attendees could locate their property and easily identify problems areas. Forms were prepared to facilitate the preparation of comments. Abbreviated summaries of the comments submitted from the public during this phase of the project are provided in Table 16.1 below, with a response from the County.

TABLE 16-1
ALAFIA RIVER WATERSHED PUBLIC MEETING NUMBER 3
COMMENTS

PROBLEM TYPE	COMMENTOR	COMMENT	RESPONSE
Flood Hazard	Bob Minthorn 8613 Magnolia St. Gibsonton, FL 33534	Stormwater drainpipe has corroded and the street is collapsing. The stormwater department has been out and says that it will be fixed.	
Flood Hazard	Terry Muse 920 Old Welcome Road Lithia, Florida 33547	There is a ditch on Old Welcome Road that holds water throughout the rainy season and promotes a mosquito problem. There are horse farms in the vicinity and the residents are concerned about West Nile Virus.	According to County records the area was recently sprayed by mosquito control, and for nuisance vegetation.
Water Quality	Bob Minthorn 8613 Magnolia St. Gibsonton, FL 33534	Trailer park east of powerline crossing and west of Magnolia have pvc pipes draining into canals connected to the river. He is concerned about potential water quality degradation.	
Flood Hazard	Ronald S. Parker 622 Barkfield St. Brandon, Florida 33511	He is pleased that the County is proposing to fix the flooding problem on Barkfield St. He has lived there for 23 years and has seen the site flood many times.	Thanks for your comment.
Flood Hazard	Ann Paul Audubon of Florida 410 Ware Blvd. Suite 702 Tampa, Florida 33619	A ditch discharging from the northern shore of the river, east of the railroad at SR 41 needs retrofitting.	

FIGURE 15.2-1

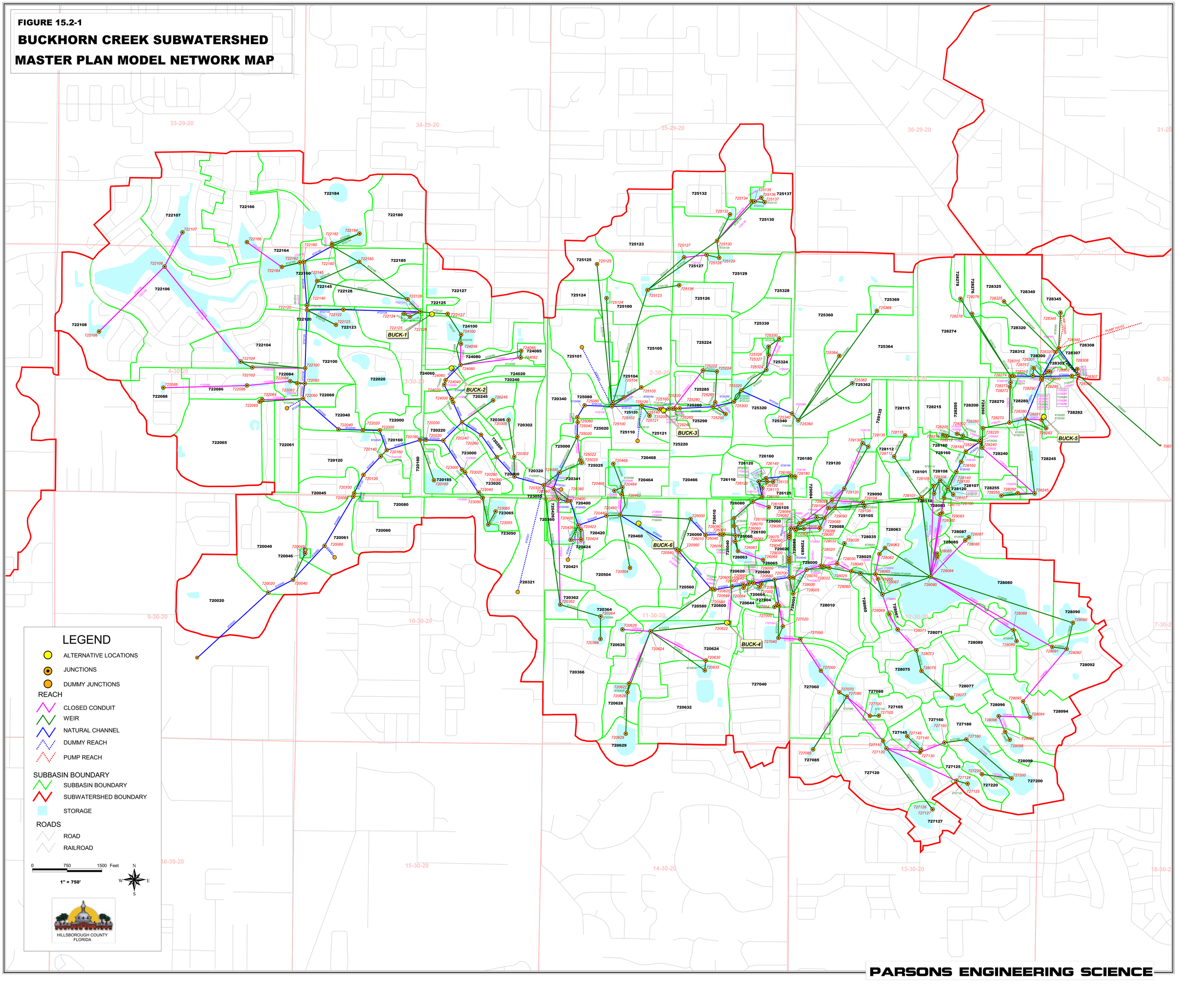
BUCKHORN CREEK SUBWATERSHED MASTER PLAN MODEL NETWORK MAP



PARSONS ENGINEERING SCIENCE

FIGURE 15.2-1

BUCKHORN CREEK SUBWATERSHED MASTER PLAN MODEL NETWORK MAP



PARSONS ENGINEERING SCIENCE

FIGURE 15.2-2

BELL CREEK SUBWATERSHED

MASTER PLAN MODEL NETWORK MAP

LEGEND

- ALTERNATIVE LOCATIONS
- JUNCTIONS
- DUMMY JUNCTIONS

CONVEYANCE NETWORK

- CREEK
- RIVER
- STRUCTURE

SUBBASIN BOUNDARY

- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

0 1000 2000 Feet

1" = 1000'

N W E S

HILLSBOROUGH COUNTY FLORIDA

BELL SHOALS RD

BOYETTE RD

BALM RIVERVIEW RD

RHODINE RD

BIG BEND RD

HOBSON SIMMONS RD

BALM BOYETTE RD

BELL-1

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-2

BELL CREEK SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

LEGEND

- ALTERNATIVE LOCATIONS
- JUNCTIONS
- DUMMY JUNCTIONS

REACH

- CLOSED CONDUIT
- WEIR
- NATURAL CHANNEL
- DUMMY REACH

SUBBASIN BOUNDARY

- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

ROADS

- ROAD
- RAILROAD

0 1000 2000 Feet

N W E S

1" = 1000'

HILLSBOROUGH COUNTY
FLORIDA

BELL-1

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-3

FISHHAWK CREEK SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

LEGEND

- JUNCTIONS
- DUMMY JUNCTIONS

CONVEYANCE NETWORK

- CREEK
- RIVER
- STRUCTURE

SUBBASIN BOUNDARY

- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

0 1200 2400 Feet

1" = 1200'

N W E S

HILLSBOROUGH COUNTY FLORIDA

FISHHAWK BLVD
LITHIA PINECREST RD
DORMAN RD
BROWNING RD
BOYETTE RD
HOBSON SIMMONS RD

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-3

FISHHAWK CREEK SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

LEGEND

- JUNCTIONS
- DUMMY JUNCTIONS

REACH
- CLOSED CONDUIT
- WEIR
- NATURAL CHANNEL
- DUMMY REACH

SUBBASIN BOUNDARY
- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

ROADS
- ROAD
- RAILROAD

0 1200 2400 Feet

1" = 1200'

N W E S

HILLSBOROUGH COUNTY
FLORIDA

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-4

TURKEY CREEK SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

LEGEND

- ALTERNATIVE LOCATIONS
- JUNCTIONS

CONVEYANCE NETWORK
- CREEK
- RIVER
- STRUCTURE

SUBBASIN BOUNDARY
- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

0 1500 3000 Feet

1" = 1500'

HILLSBOROUGH COUNTY
FLORIDA

MARTIN LUTHER KING BLVD
SYDNEY RD
SALEM CHURCH RD
W O GRIFFIN RD
EDWARDS RD
SYDNEY RD
CHARLIE GRIFFIN RD
W ALEXANDER ST
JAMES L REDMAN PKWY
SAM ASTIN RD
MUD LAKE RD
W TRAPNELL RD
SPARKMAN RD
KILGORE RD
COLSON RD
COWART RD
PIPPIN RD
HOLLOWAY RD
BERRY PATCH RD
TURKEY CREEK RD
N DOVER RD
E STATE ROAD 60
W STATE ROAD 60
S MILLER RD
S DOVER RD
S COUNTY ROAD 39
S VALRICO RD
DURANT RD
LITHIA PINECREST RD
HENRY GEORGE RD
W KEYSVILLE RD
TC-1
TC-2
TC-3
TC-4
TC-5
TC-6

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-4

TURKEY CREEK SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

LEGEND

- ALTERNATIVE LOCATIONS
- JUNCTIONS

REACH

- CLOSED CONDUIT
- WEIR
- NATURAL CHANNEL
- DUMMY REACH
- PUMP REACH

SUBBASIN BOUNDARY

- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

ROADS

- ROAD
- RAILROAD

0 2000 4000 Feet

1" = 2000'

N W E S

HILLSBOROUGH COUNTY FLORIDA

TC-1 TC-2 TC-3 TC-4 TC-5 TC-6

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-5

ENGLISH CREEK SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

HILLSBOROUGH COUNTY

POLK COUNTY

S WOODSMAN RD

RICE RD

SPARKMAN RD

NESMITH RD

OLD HOPEWELL RD

E TRAPNELL RD

ENG-1

ENG-2

ENG-3

ENG-4

LEGEND

ALTERNATIVE LOCATIONS

JUNCTIONS

CONVEYANCE NETWORK

CREEK

RIVER

STRUCTURE

SUBBASIN BOUNDARY

SUBBASIN BOUNDARY

SUBWATERSHED BOUNDARY

STORAGE

ROADS

ROAD

RAILROAD

0 2000 4000 Feet

1" = 2000'

N

W E

S

HILLSBOROUGH COUNTY
FLORIDA

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-5

ENGLISH CREEK SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

HILLSBOROUGH COUNTY

POLK COUNTY

S WIGGINS RD

RICE RD

SPARKMAN RD

NESMITH RD

OLD HOPEWELL RD

E TRAPNELL RD

ENG-1

ENG-2

ENG-3

ENG-4

LEGEND

- ALTERNATIVE LOCATIONS
- JUNCTIONS

REACH
- WEIR
- CLOSED CONDUIT
- NATURAL CHANNEL

SUBBASIN BOUNDARY
- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

ROADS
- ROAD
- RAILROAD

0 2000 4000 Feet

1" = 2000'

N W E S

HILLSBOROUGH COUNTY FLORIDA

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-6

NORTH PRONG ALAFIA RIVER SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

LEGEND

- JUNCTIONS
- CONVEYANCE NETWORK
  - CREEK
  - RIVER
  - STRUCTURE
- SUBBASIN BOUNDARY
  - SUBBASIN BOUNDARY
  - SUBWATERSHED BOUNDARY
- STORAGE
- ROADS
  - ROAD
  - RAILROAD

0 3000 6000 Feet

1" = 3000'

N W E S

HILLSBOROUGH COUNTY FLORIDA

HILLSBOROUGH COUNTY

POLK COUNTY

HOPTON RD

HENRY GEORGE RD

PRITCHER RD

NICHOLS RD

PORTER RD

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-6

NORTH PRONG ALAFIA RIVER SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

LEGEND

- JUNCTIONS
- REACH
  - CLOSED CONDUIT
  - WEIR
  - NATURAL CHANNEL
- SUBBASIN BOUNDARY
  - SUBBASIN BOUNDARY
  - SUBWATERSHED BOUNDARY
- STORAGE
- ROADS
  - ROAD
  - RAILROAD

0 3000 6000 Feet

1" = 3000'

N W E S

HILLSBOROUGH COUNTY
FLORIDA

HILLSBOROUGH COUNTY

POLK COUNTY

HENRY GEORGE RD

HORTON RD

PRITCHER RD

NICHOLS RD

PORTER RD

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-7

SOUTH PRONG ALAFIA RIVER SUBWATERSHED MASTERPLAN MODEL NETWORK MAP

LEGEND

- ALTERNATIVE LOCATIONS
- JUNCTIONS

CONVEYANCE NETWORK
- CREEK
- RIVER
- STRUCTURE

SUBBASIN BOUNDARY
- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

ROADS
- ROAD
- RAILROAD

0 3000 6000 Feet

1" = 3000'

HILLSBOROUGH COUNTY FLORIDA

HILLSBOROUGH COUNTY

POLK COUNTY

LITHIA PINECREST RD

E KEYSVILLE RD

WALLER HUNTER RD

HISCOCK RD

STATE ROAD 674

SP-1

SP-2

SP-3

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-7

SOUTH PRONG ALAFIA RIVER SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

LEGEND

- ALTERNATIVE LOCATIONS
- JUNCTIONS

REACH
- WEIR
- CLOSED CONDUIT
- NATURAL CHANNEL

SUBBASIN BOUNDARY
- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

ROADS
- ROAD
- RAILROAD

0 3000 6000 Feet

1" = 3000'

N W E S

HILLSBOROUGH COUNTY FLORIDA

HILLSBOROUGH COUNTY

POLK COUNTY

LITHIA PINECREST RD

E KEYSVILLE RD

WALTER HUNTER RD

S COUNTY ROAD 39

HISCOCK RD

STATE ROAD 674

SP-1

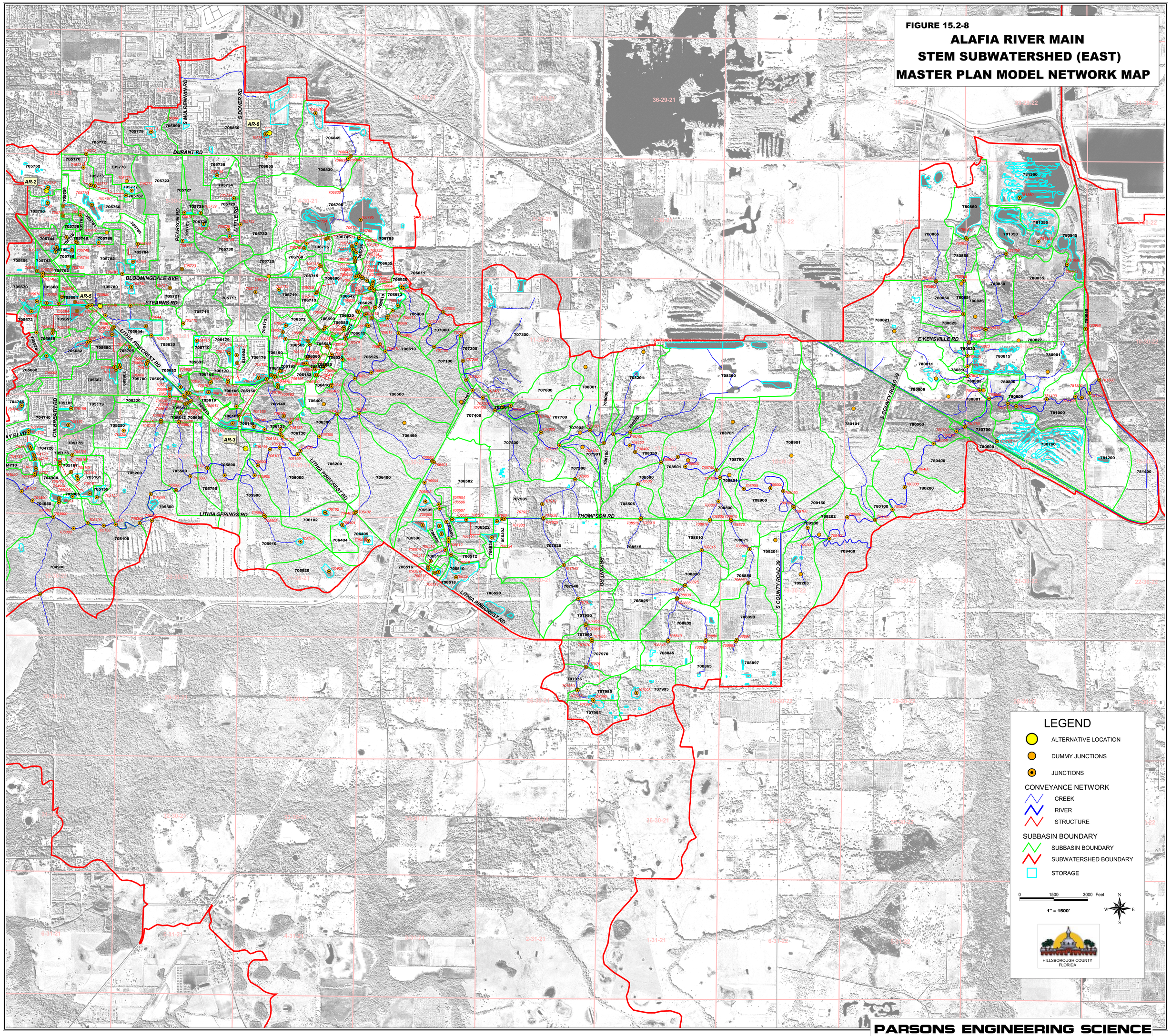
SP-2

SP-3

PARSONS ENGINEERING SCIENCE

FIGURE 15.2-8

ALAFIA RIVER MAIN STEM SUBWATERSHED (EAST) MASTER PLAN MODEL NETWORK MAP



PARSONS ENGINEERING SCIENCE

FIGURE 15.2-8

ALAFIA RIVER MAIN (EAST) STEM SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

AR-2
AR-3
AR-5
AR-6

LEGEND

- ALTERNATIVE LOCATION
- JUNCTIONS
- DUMMY JUNCTIONS

REACH
- CLOSED CONDUIT
- WEIR
- NATURAL CHANNEL
- DUMMY REACH
- PUMP REACH

SUBBASIN BOUNDARY
- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

ROADS
- ROAD
- RAILROAD

0 1500 3000 4500 Feet

1" = 1500'

N W E S

HILLSBOROUGH COUNTY
FLORIDA

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FIGURE 15.2-8

ALAFIA RIVER MAIN STEM SUBWATERSHED (WEST) MASTER PLAN MODEL NETWORK MAP

LEGEND

- ALTERNATIVE LOCATION
- DUMMY JUNCTIONS
- JUNCTIONS

CONVEYANCE NETWORK

- CREEK
- RIVER
- STRUCTURE

SUBBASIN BOUNDARY

- SUBBASIN BOUNDARY
- SUBWATERSHED BOUNDARY
- STORAGE

0 1500 3000 Feet

1" = 1500'

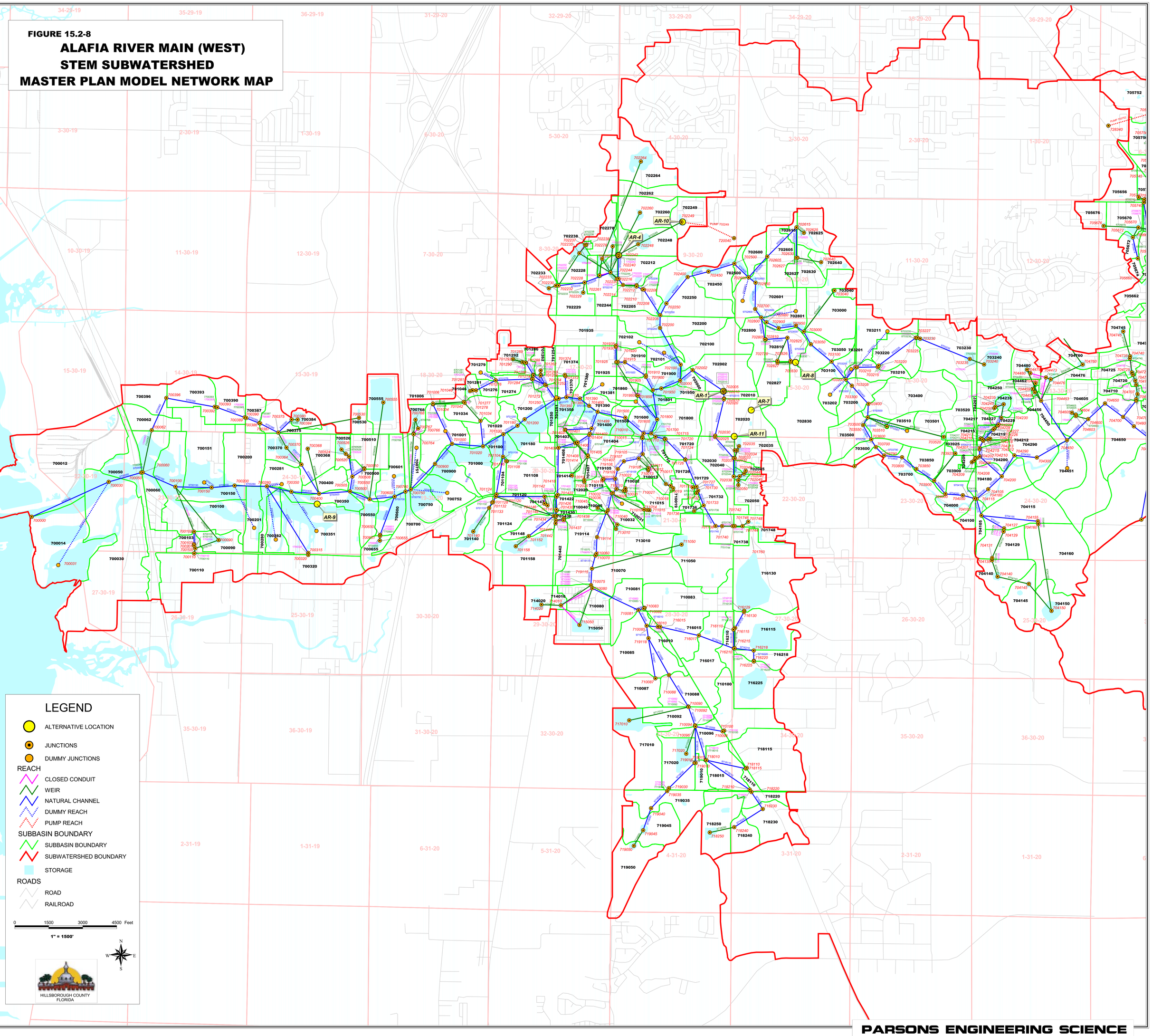
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HILLSBOROUGH COUNTY FLORIDA

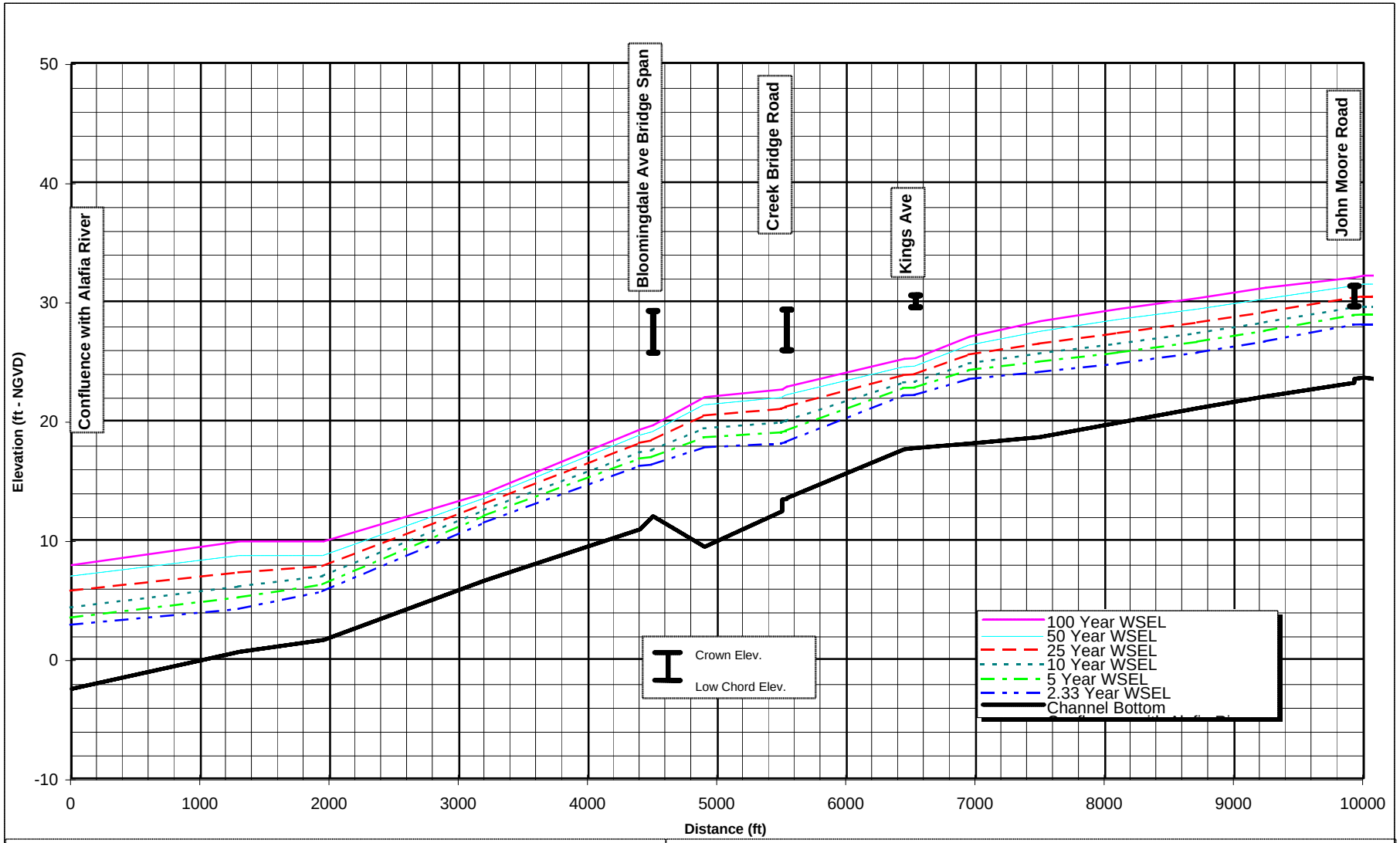
PARSONS ENGINEERING SCIENCE

FIGURE 15.2-8

ALAFIA RIVER MAIN (WEST) STEM SUBWATERSHED MASTER PLAN MODEL NETWORK MAP

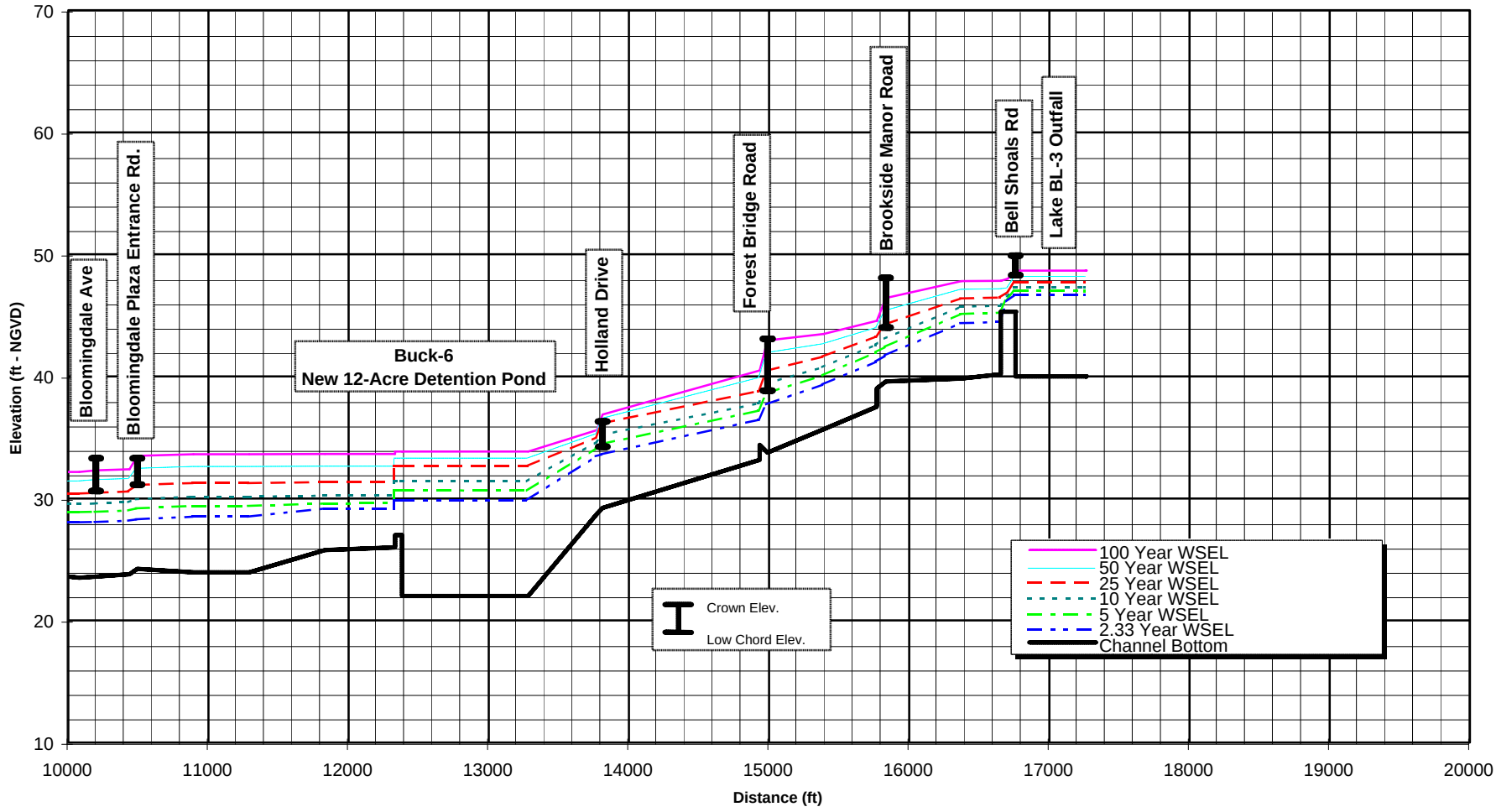


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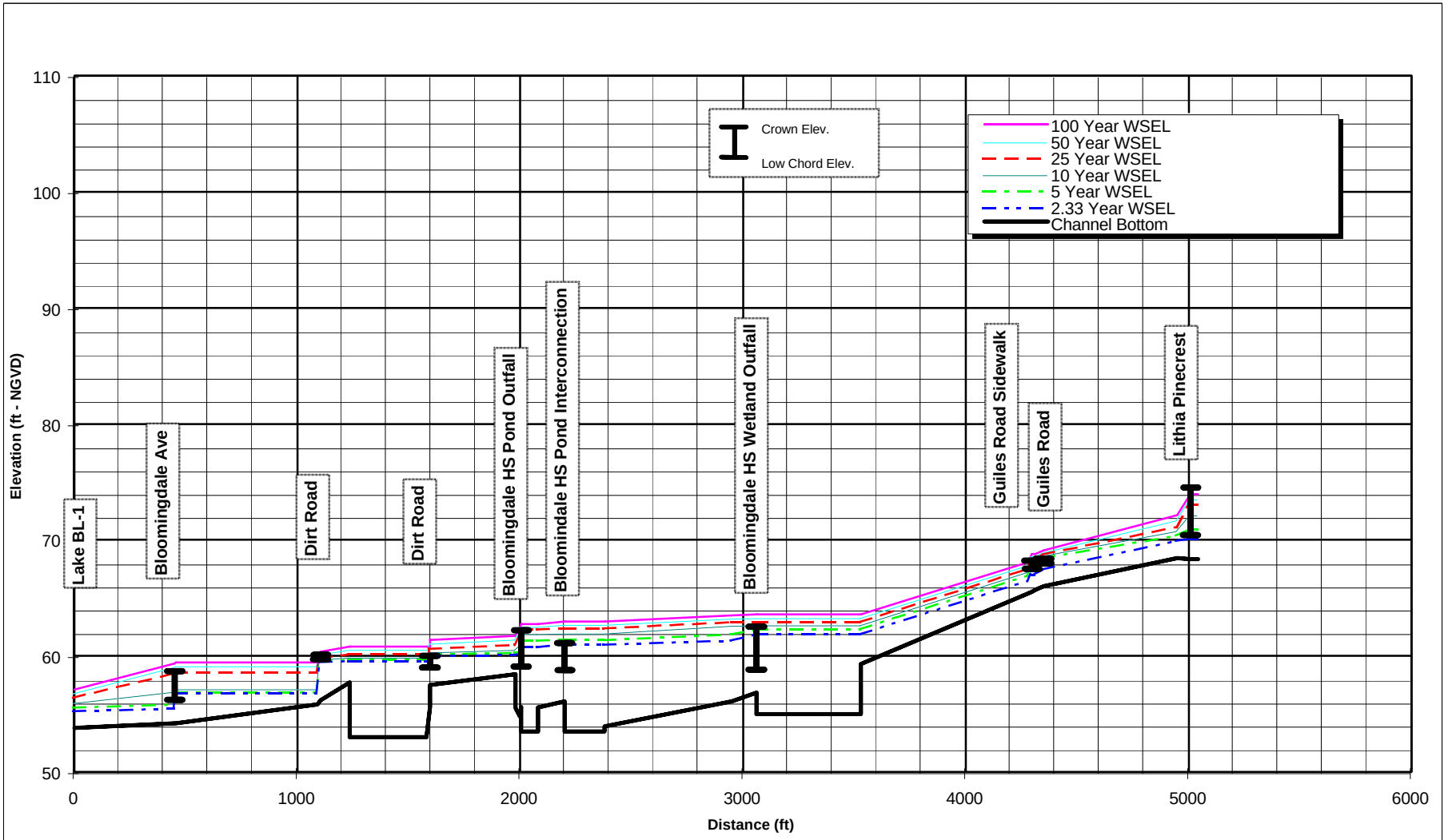
Buckhorn Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-9
Buckhorn Creek \ Main Channel
Sheet 1 of 9



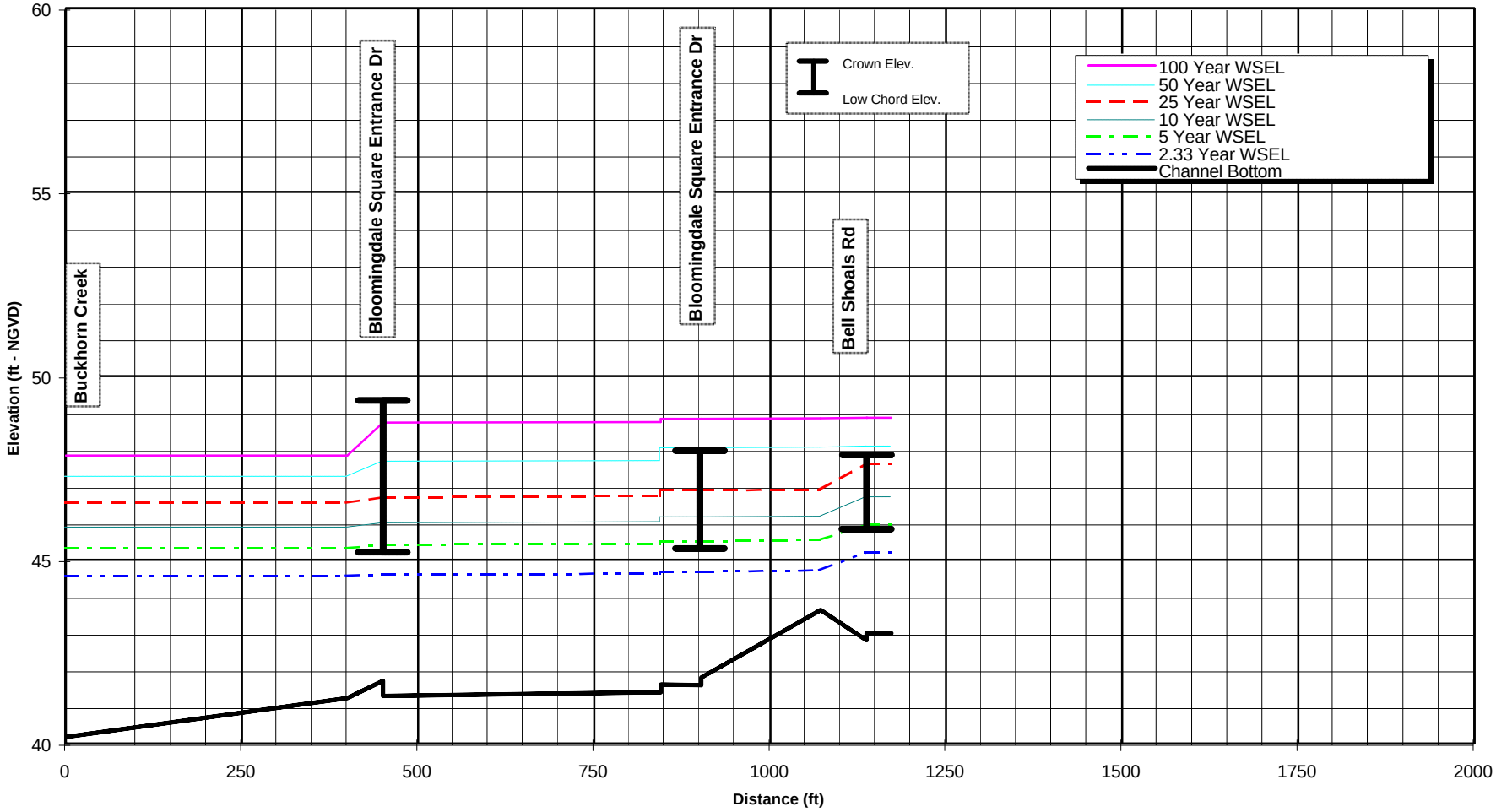
Buckhorn Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-9
Buckhorn Creek \ Main Channel
Sheet 2 of 9



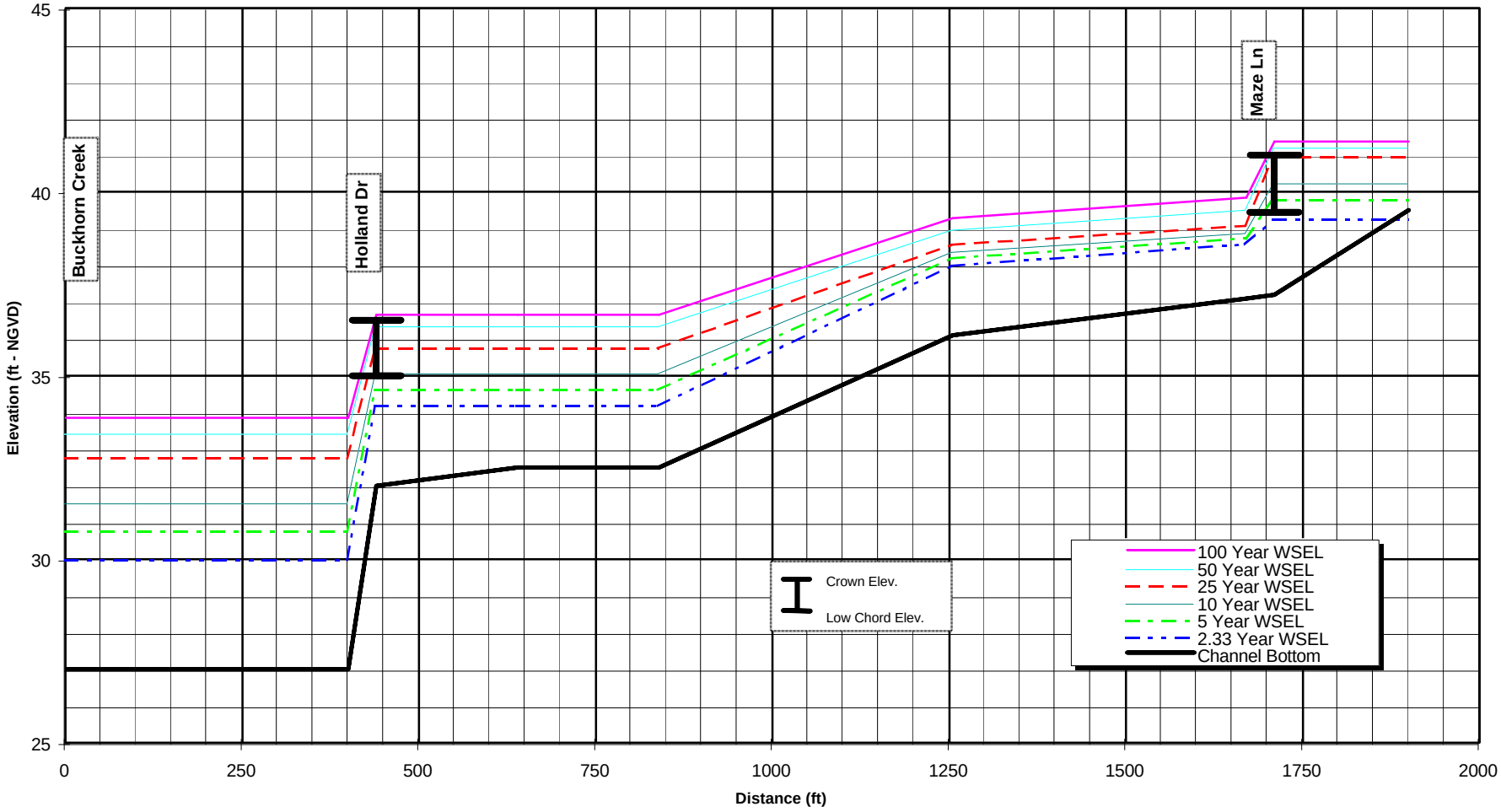
Buckhorn Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-9
Buckhorn Creek \ Hurley Ditch
Sheet 3 of 9



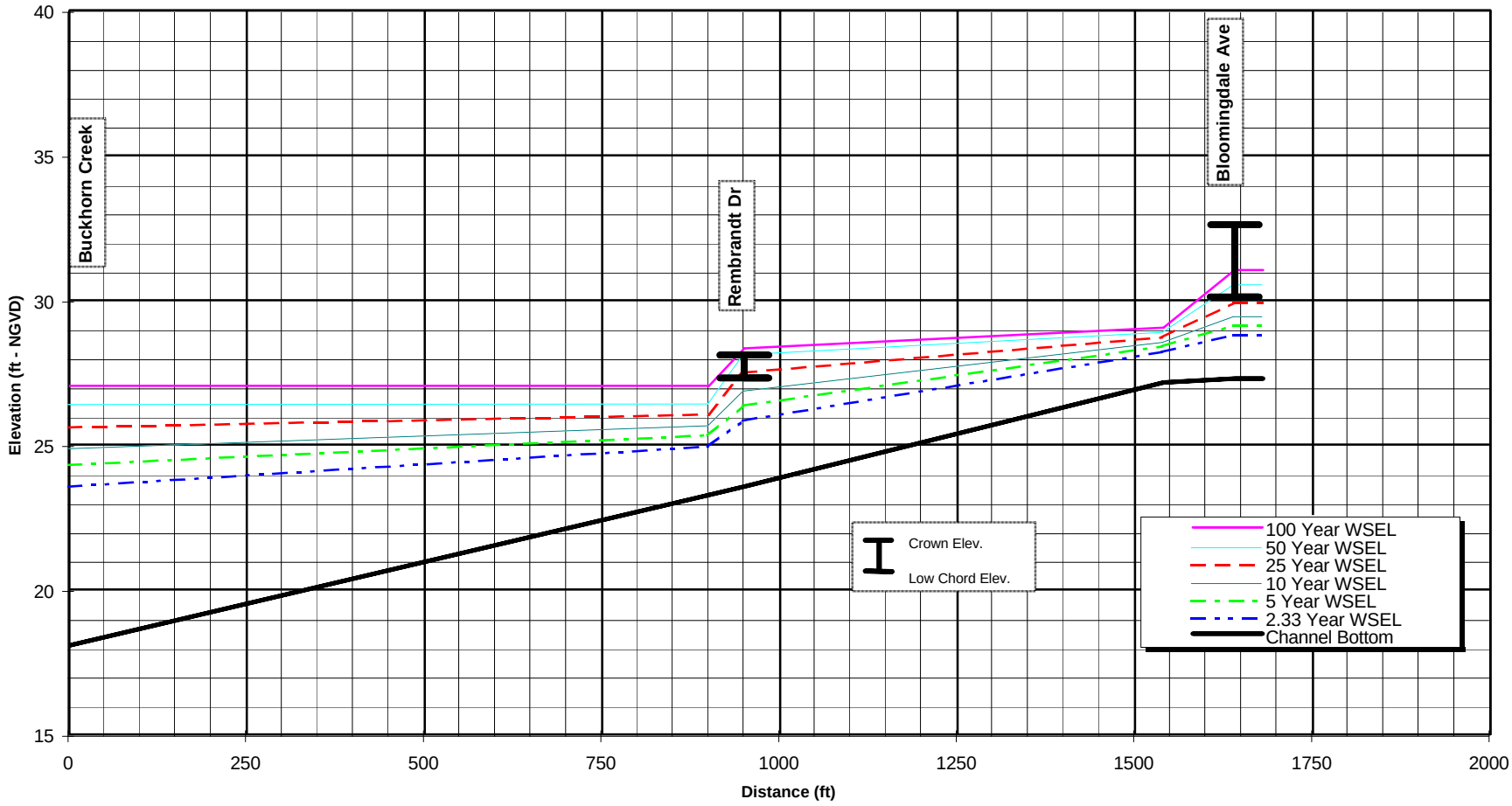
Buckhorn Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-9
Buckhorn Creek \ NE Tributary System
Sheet 4 of 9



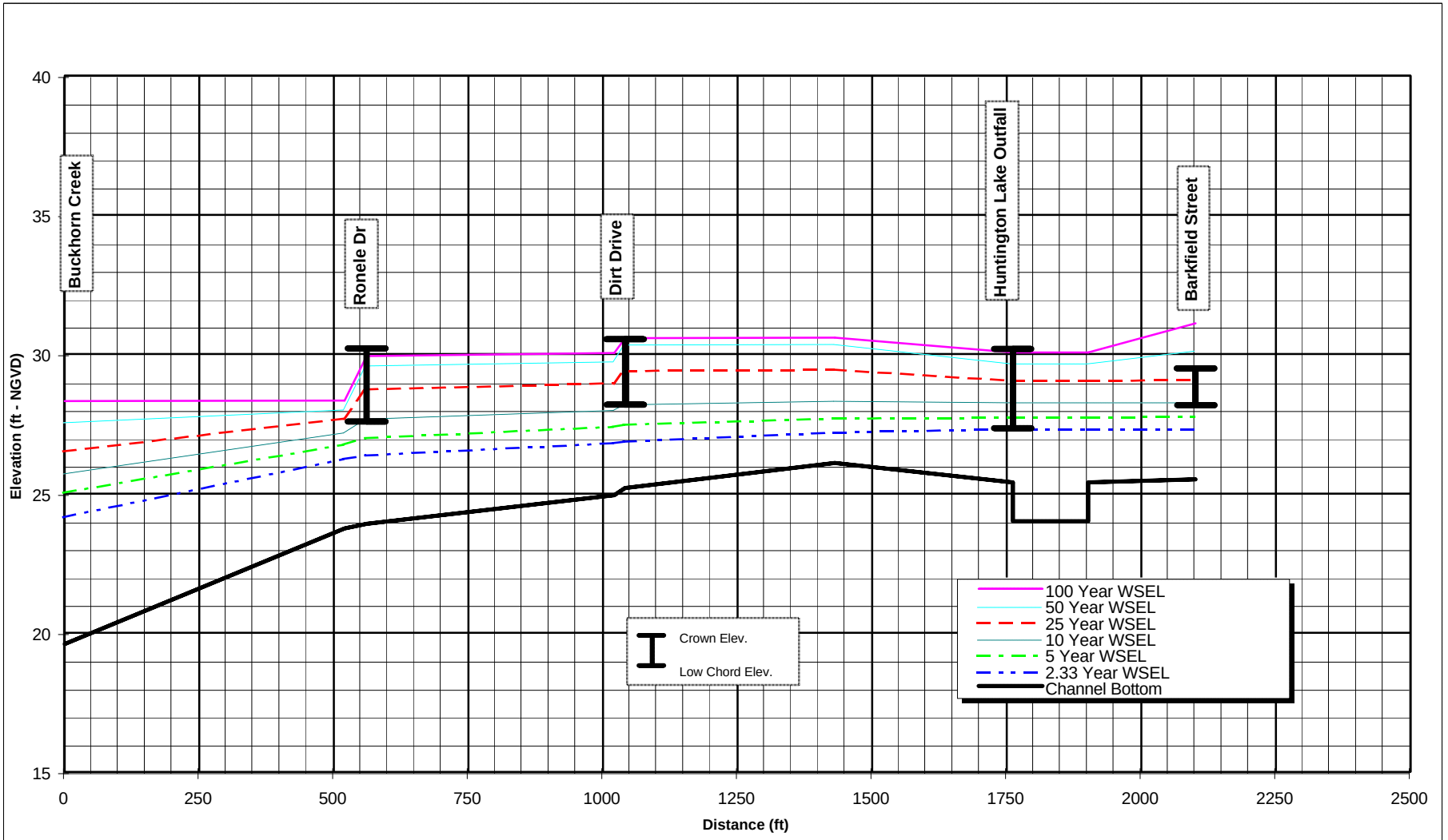
Buckhorn Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-9
Buckhorn Creek \ Tributary GG
Sheet 5 of 9



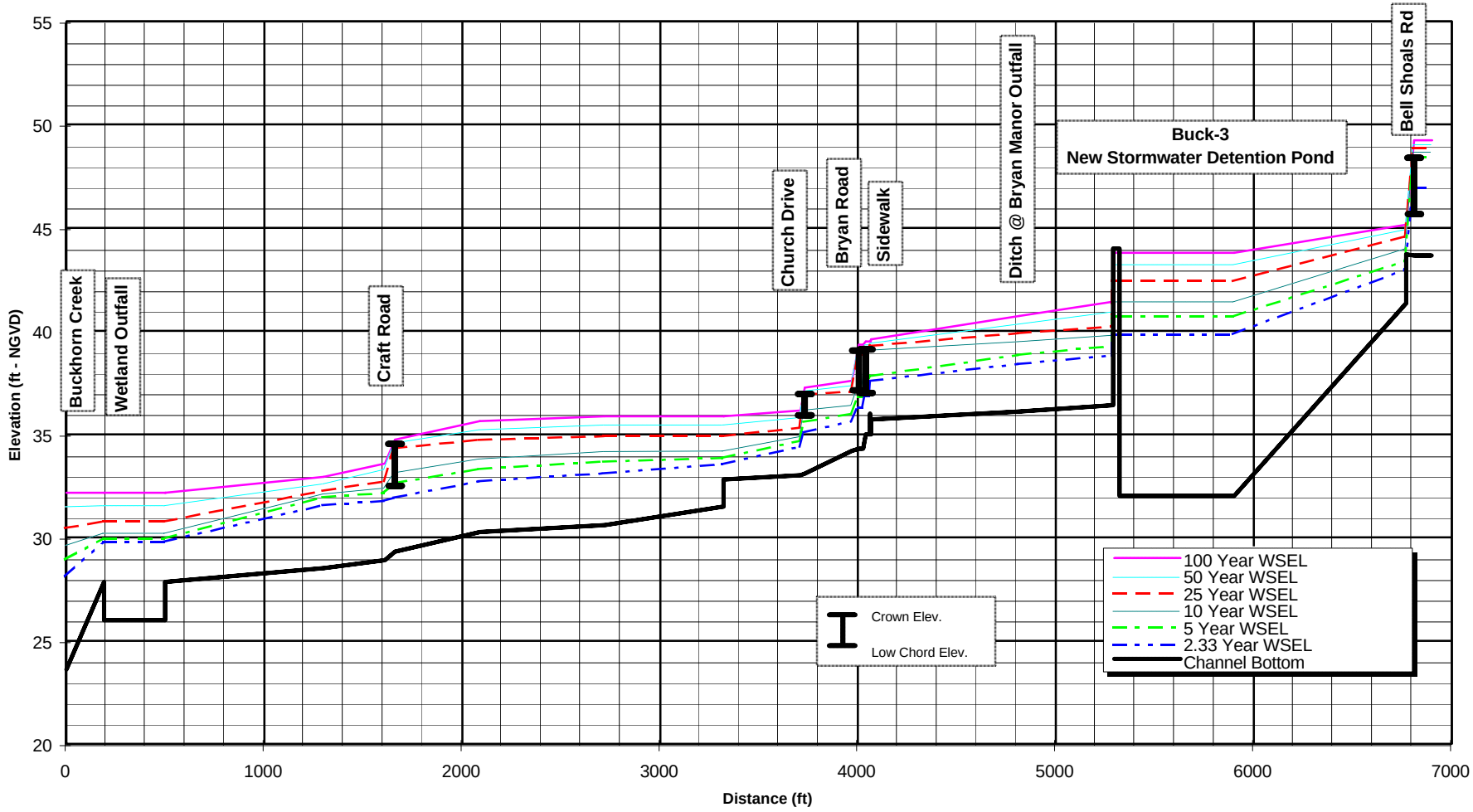
Buckhorn Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-9
Buckhorn Creek \ Tributary C
Sheet 6 of 9



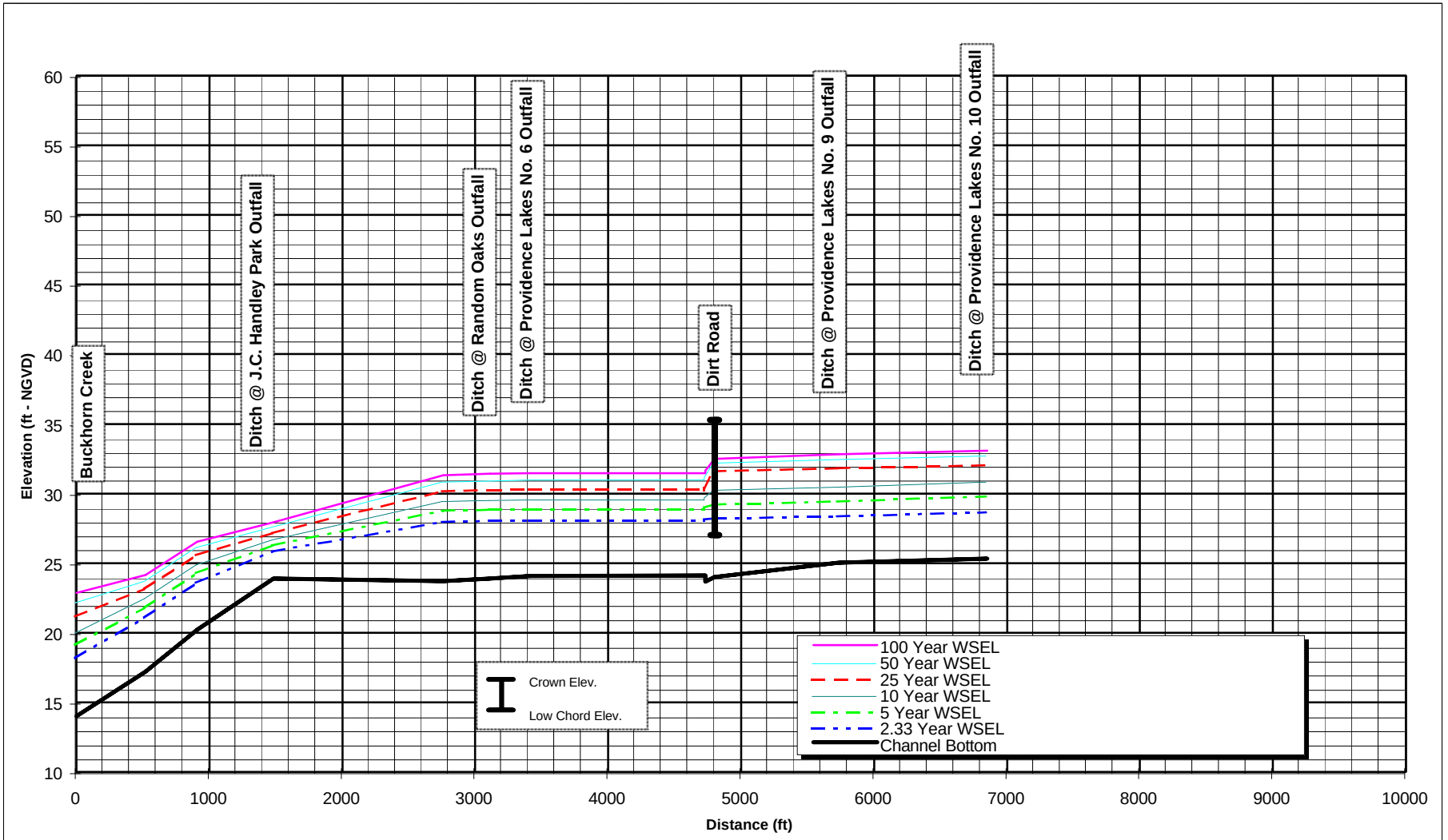
Buckhorn Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-9
Buckhorn Creek \ Tributary D
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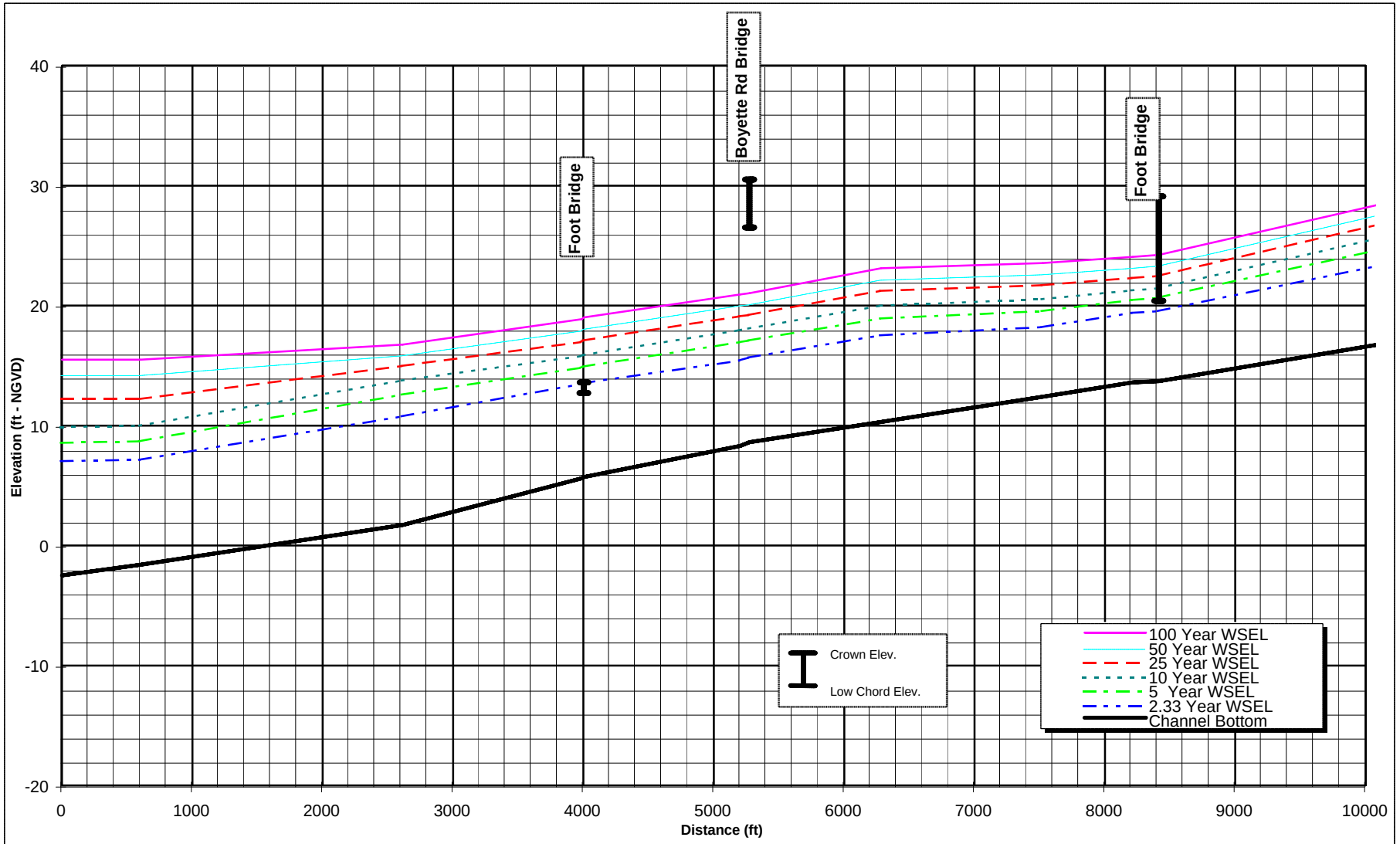
Buckhorn Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-9
Buckhorn Creek \ Craft Road Ditch
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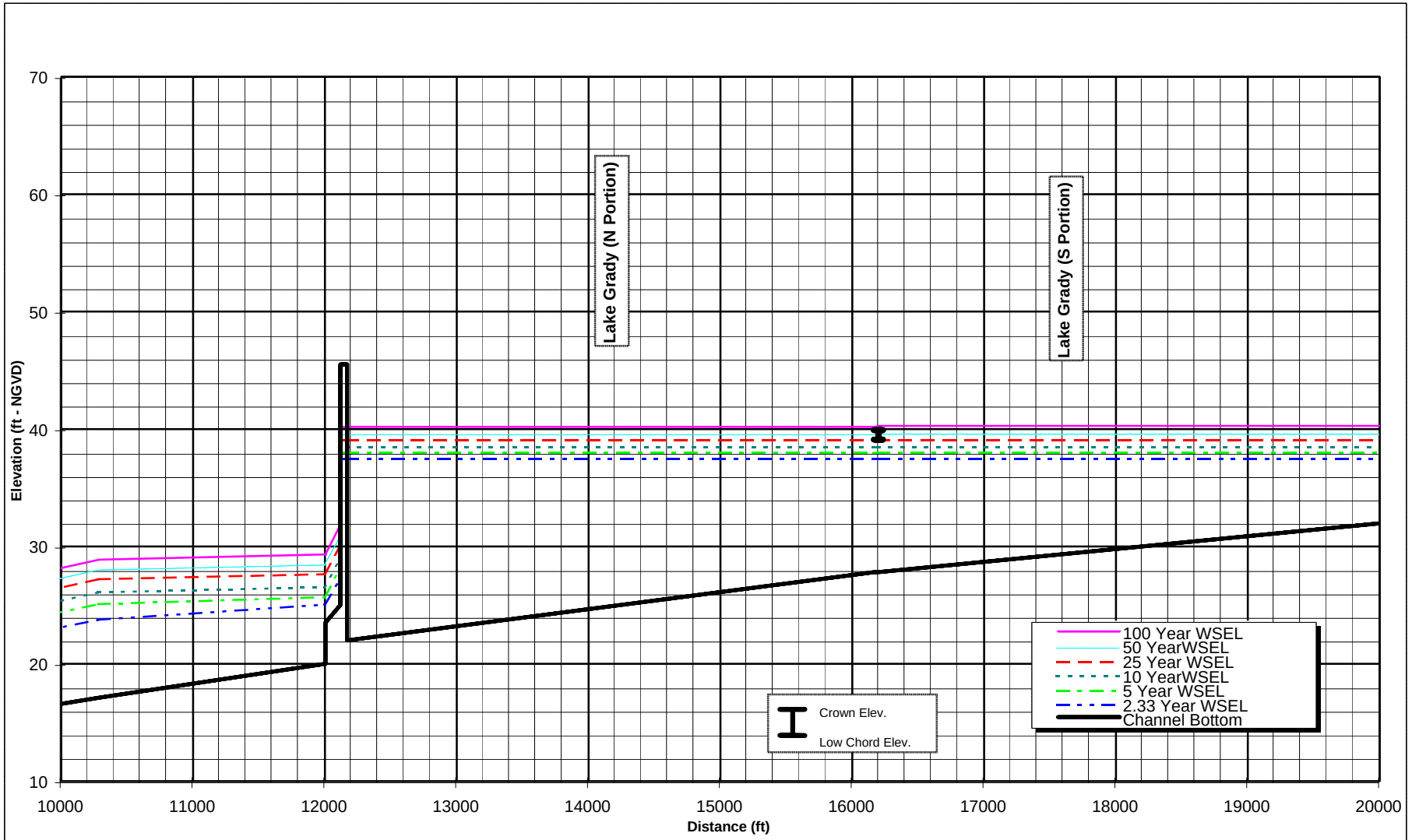
Buckhorn Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-9
Buckhorn Creek \ Tanglewood Ditch
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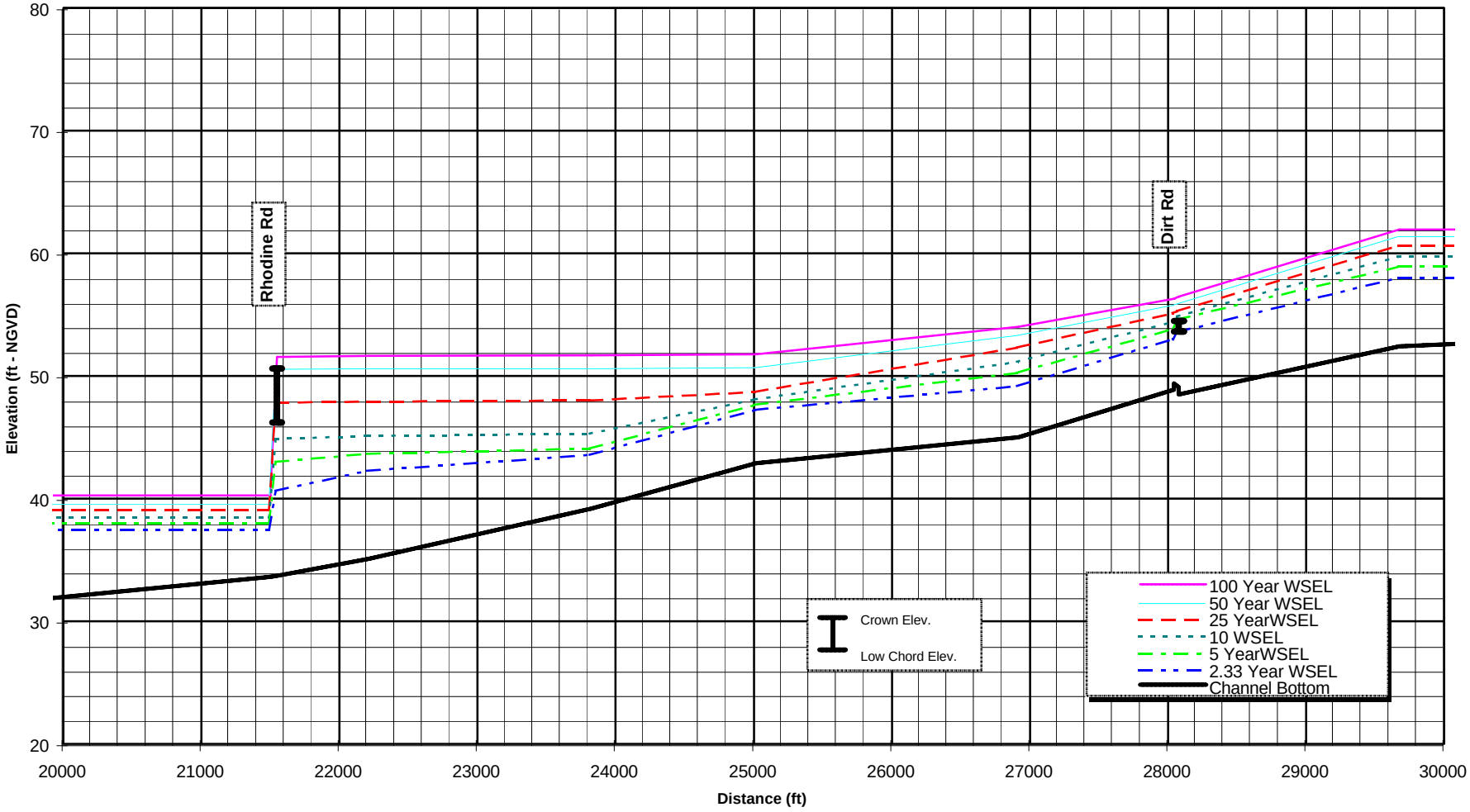
Bell Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-10
Bell Creek \ Main Channel
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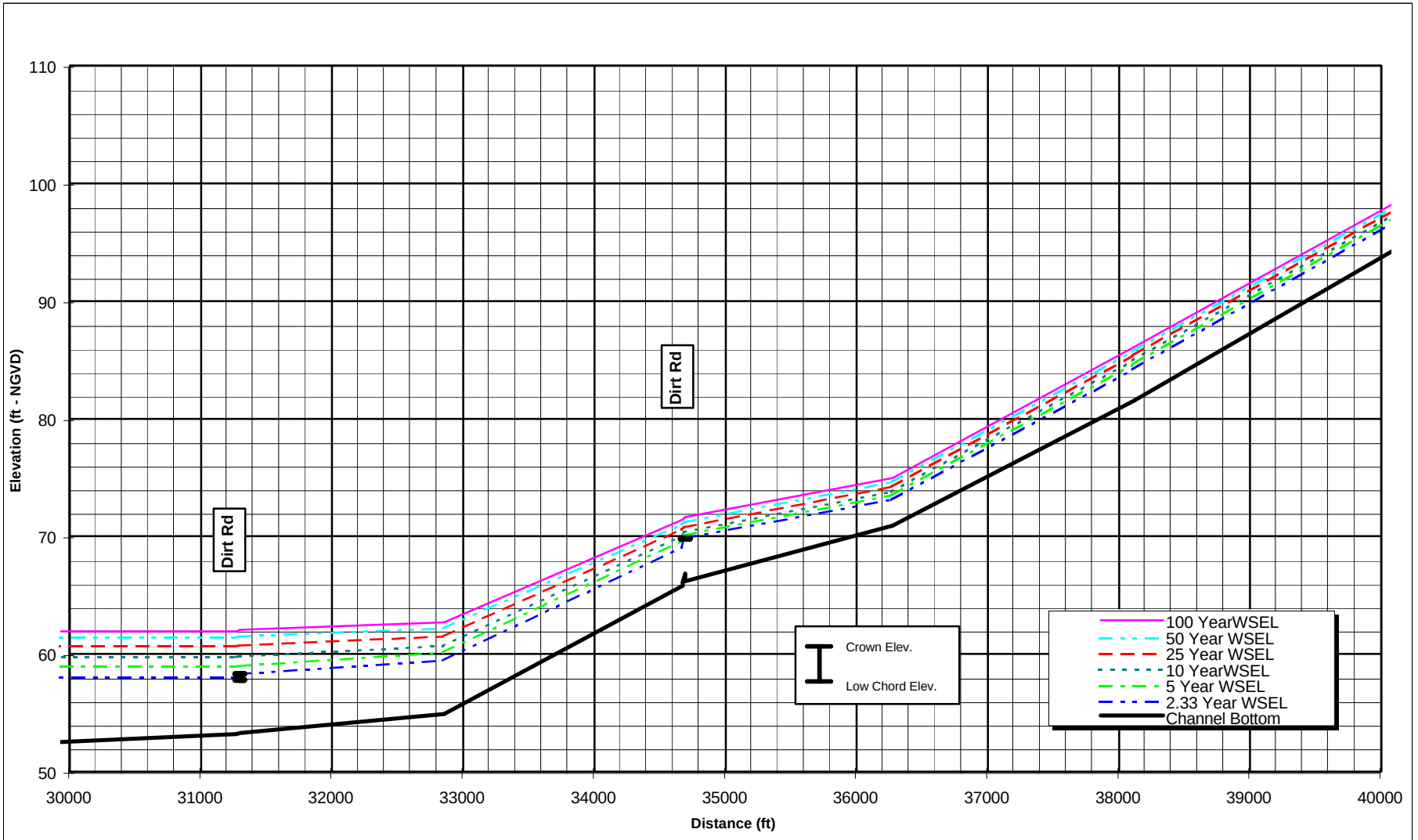
Bell Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-10
Bell Creek \ Main Channel
Sheet 2 of 8



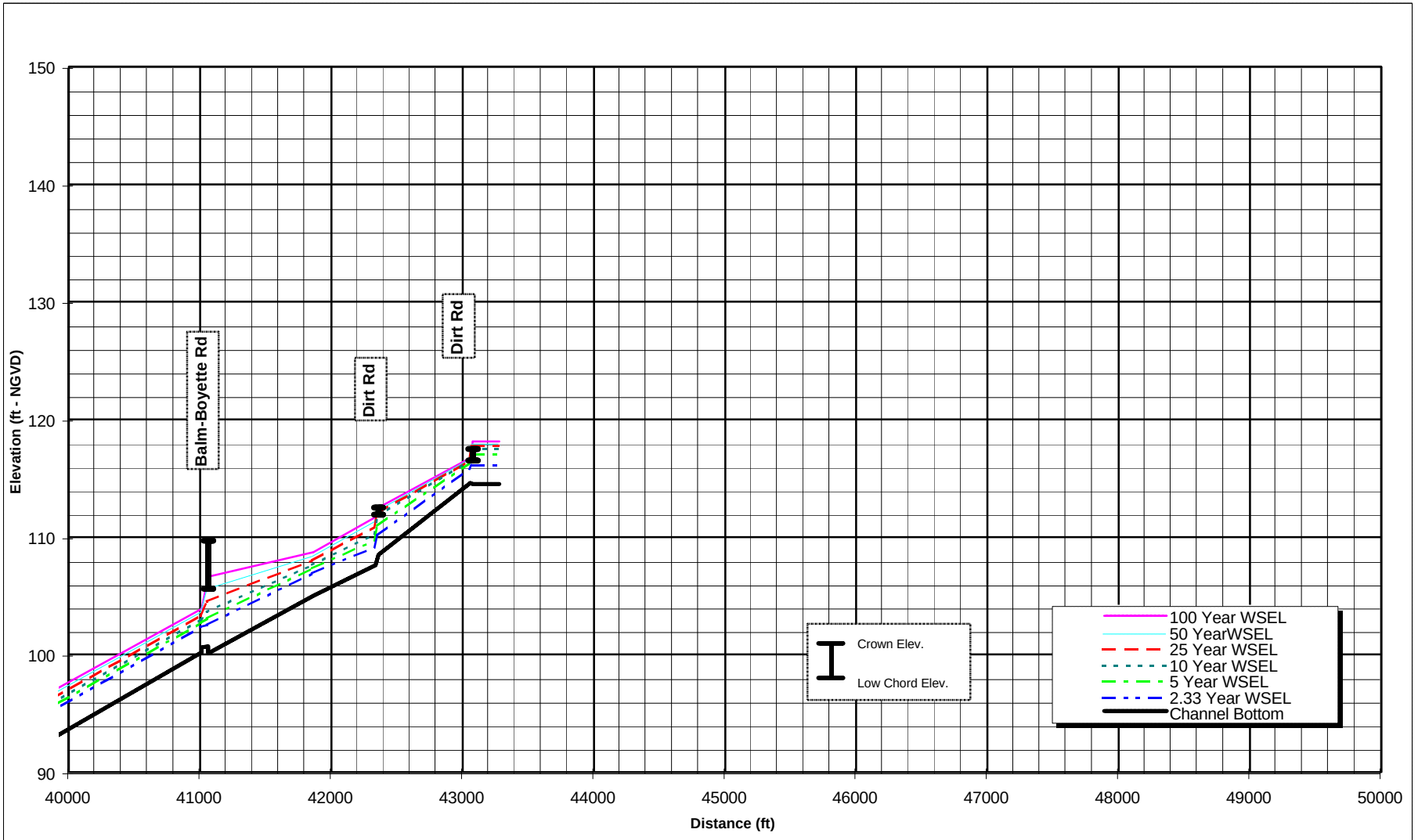
Bell Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-10
Bell Creek \ Main Channel
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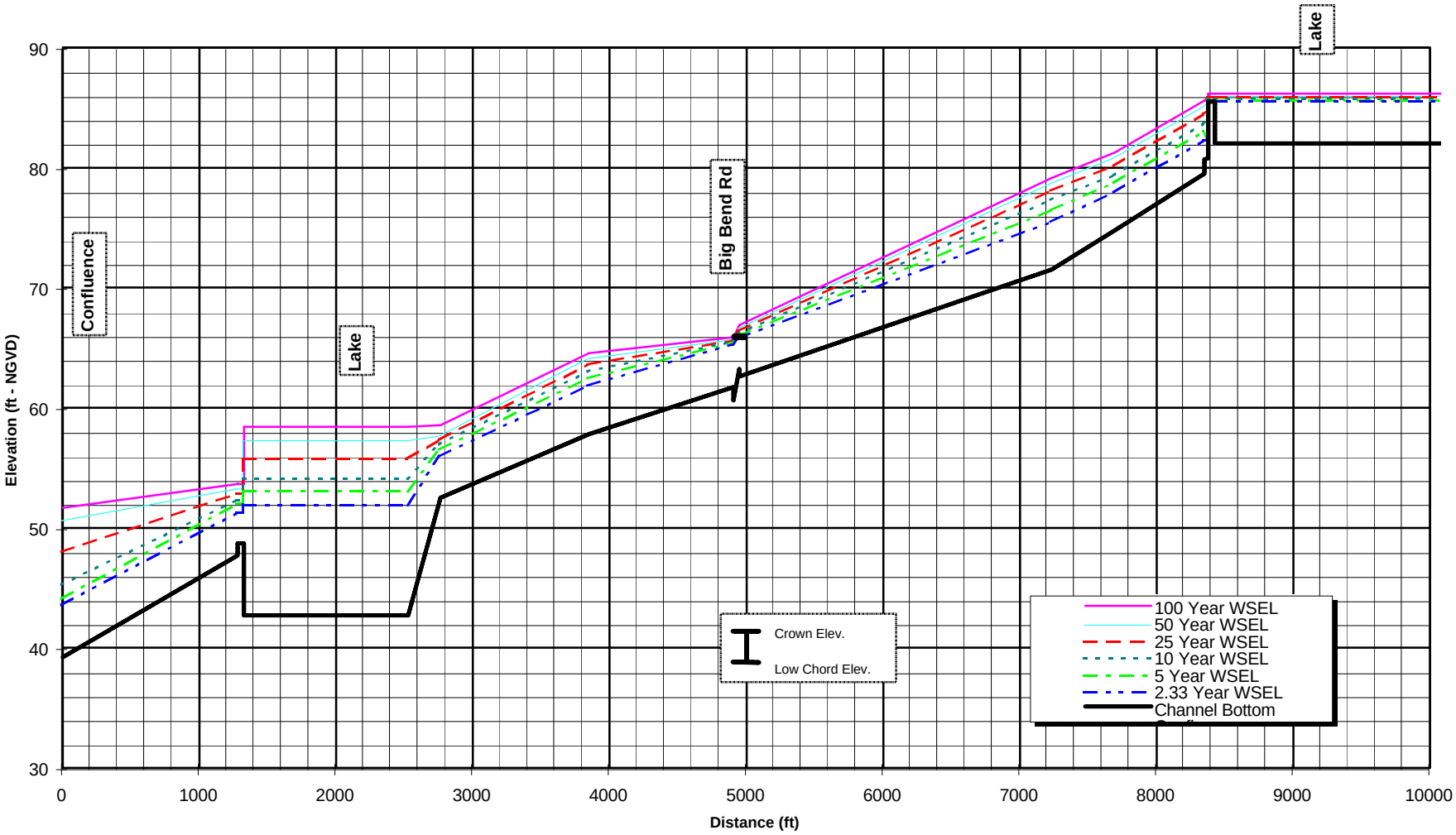
Bell Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-10
Bell Creek \ Main Channel
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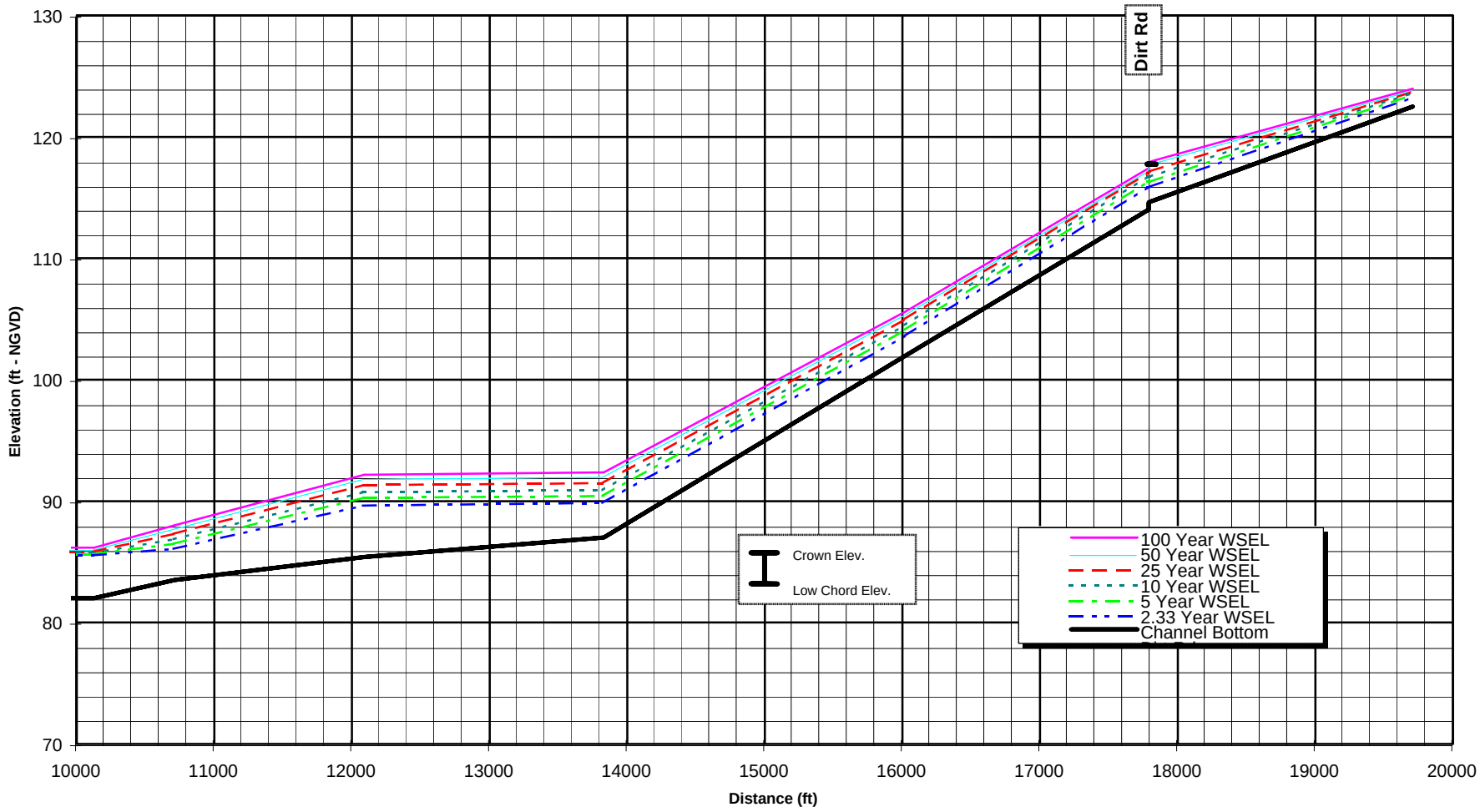
Bell Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-10
Bell Creek \ Main Channel
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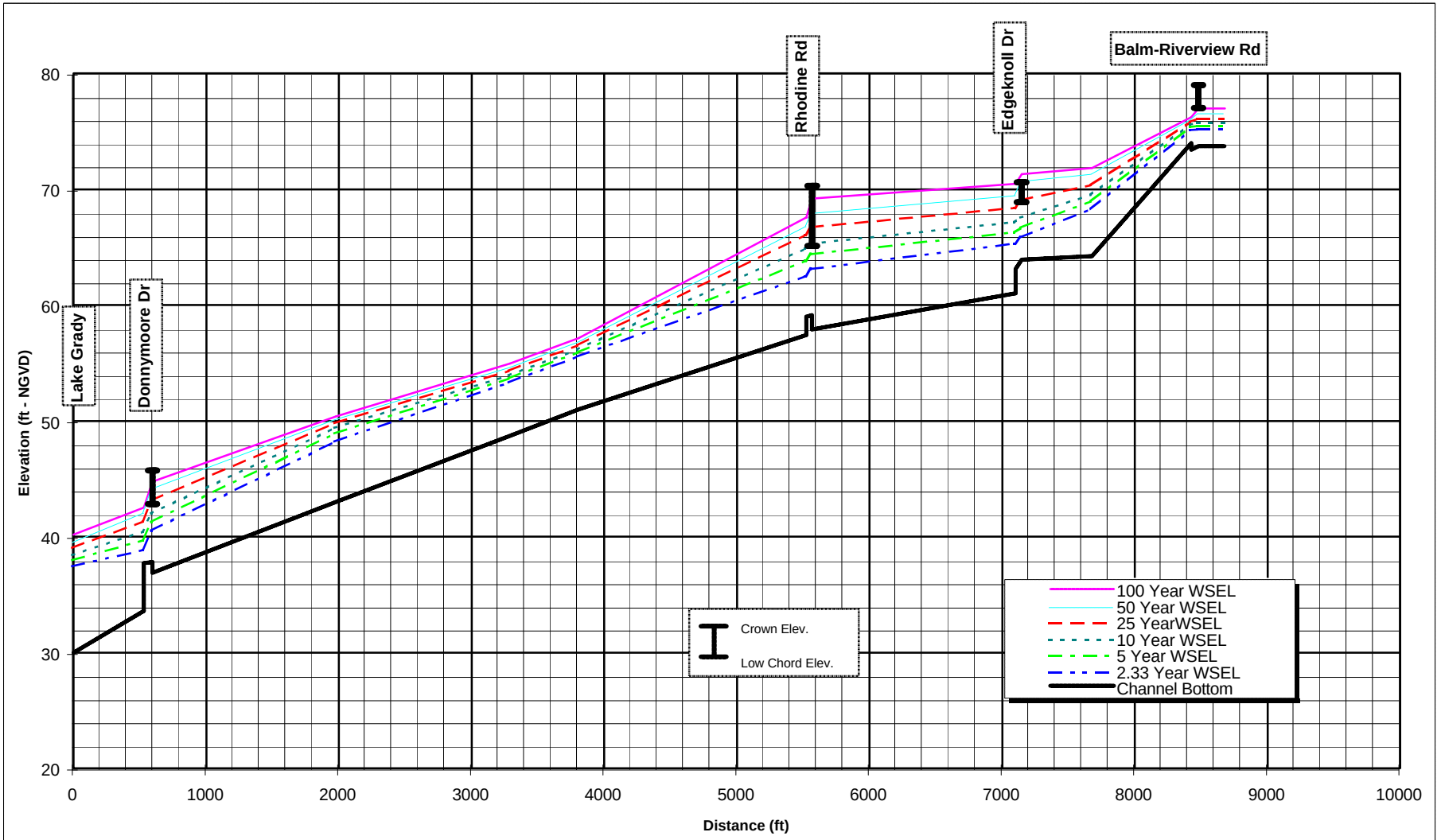
Bell Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-10
Bell Creek \ Boggy Branch Tributary
Sheet 6 of 8



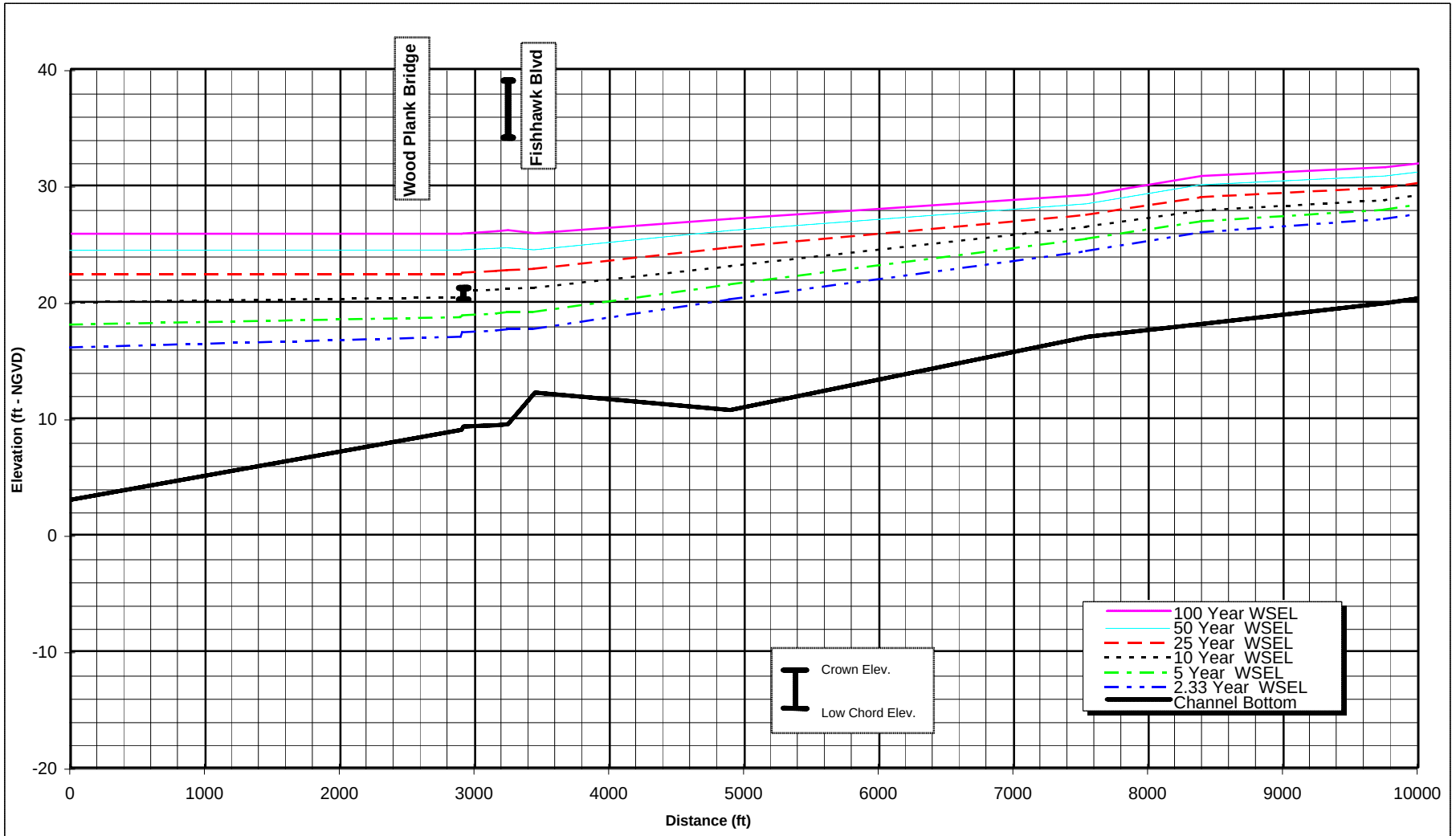
Bell Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-10
Bell Creek \ Boggy Branch Tributary
Sheet 7 of 8



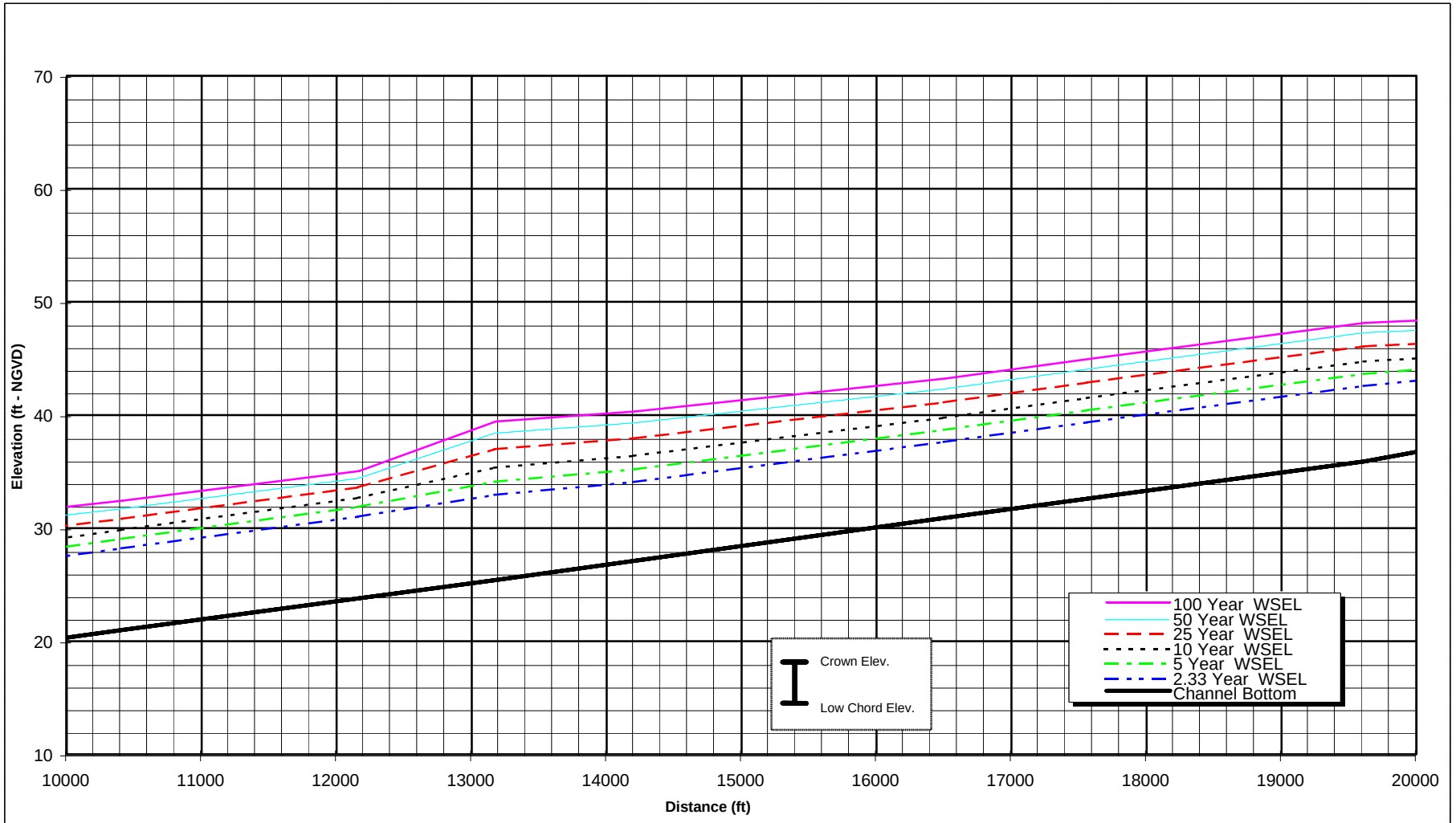
Bell Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-10
Bell Creek \ Pelleham Branch Tributary
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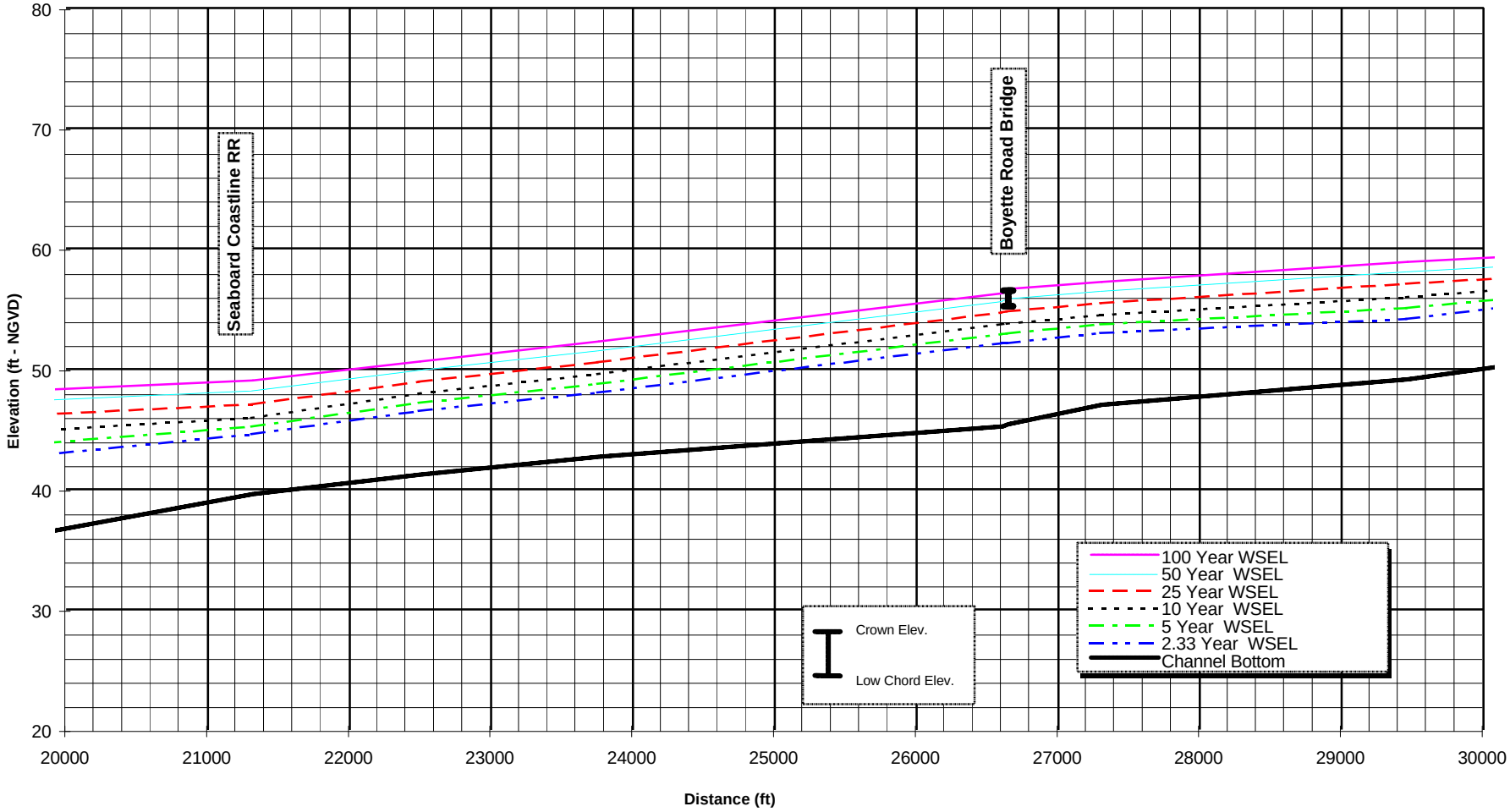
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Main Channel
Sheet 1 of 12



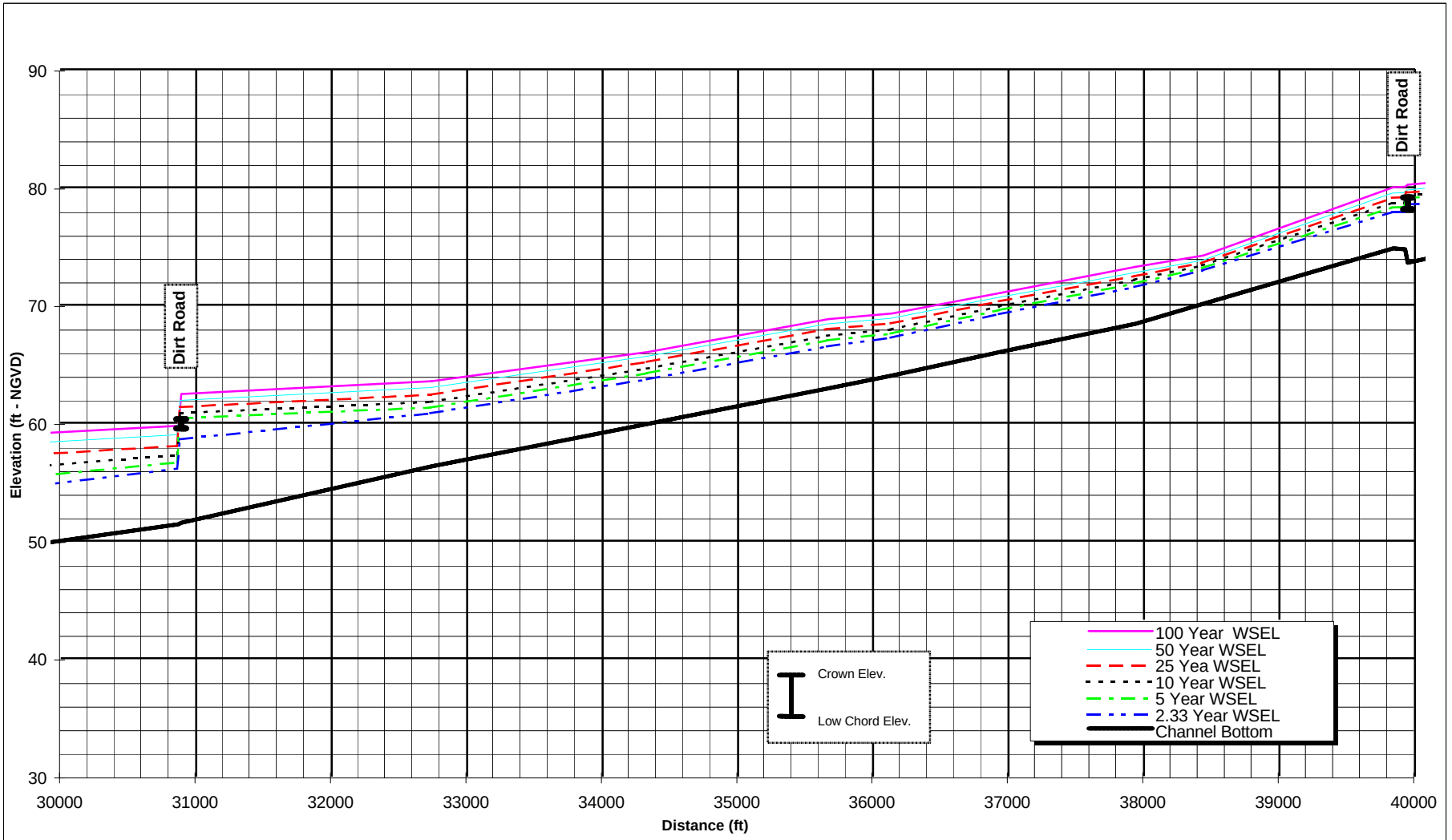
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Main Channel
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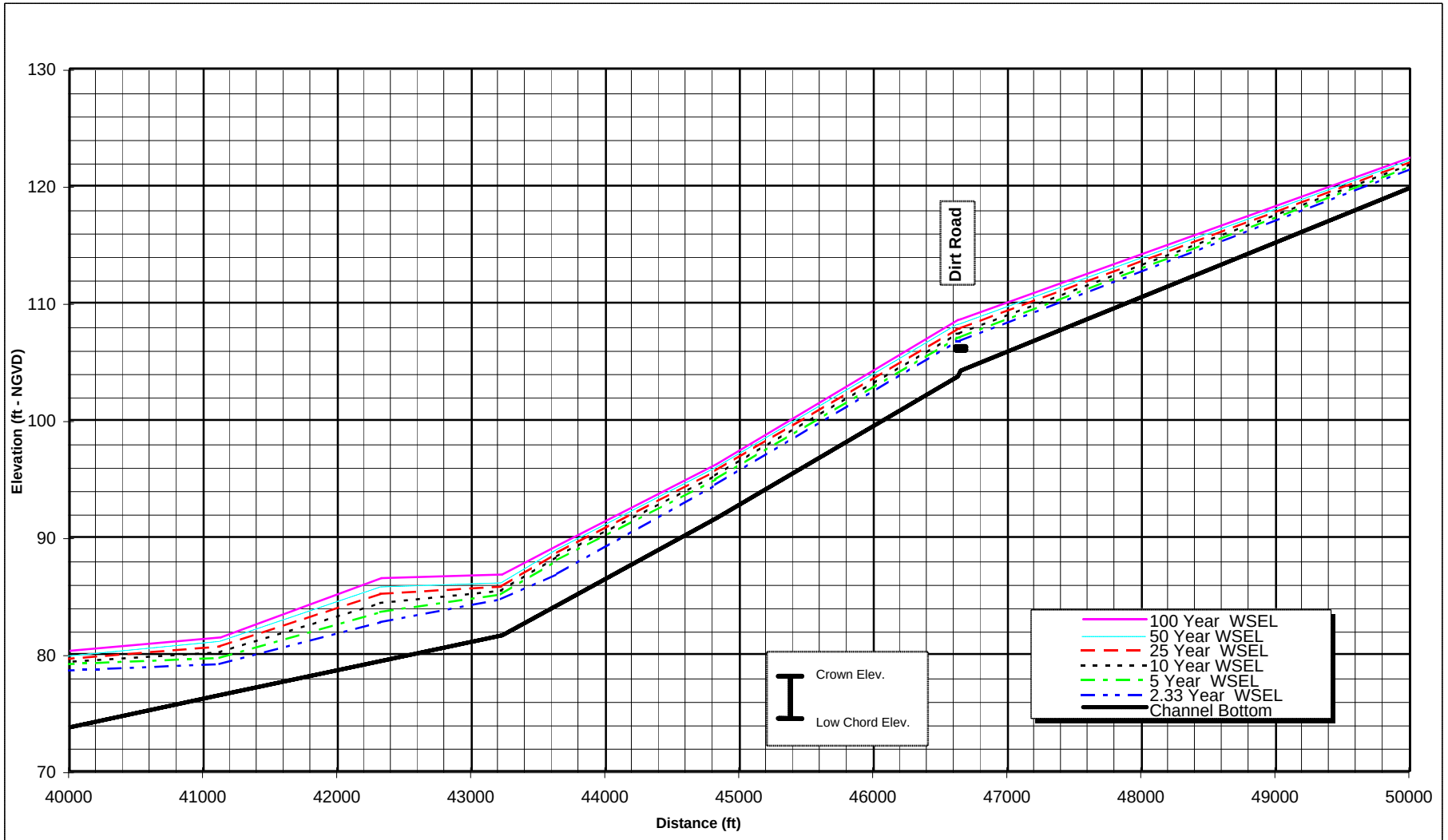
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Main Channel
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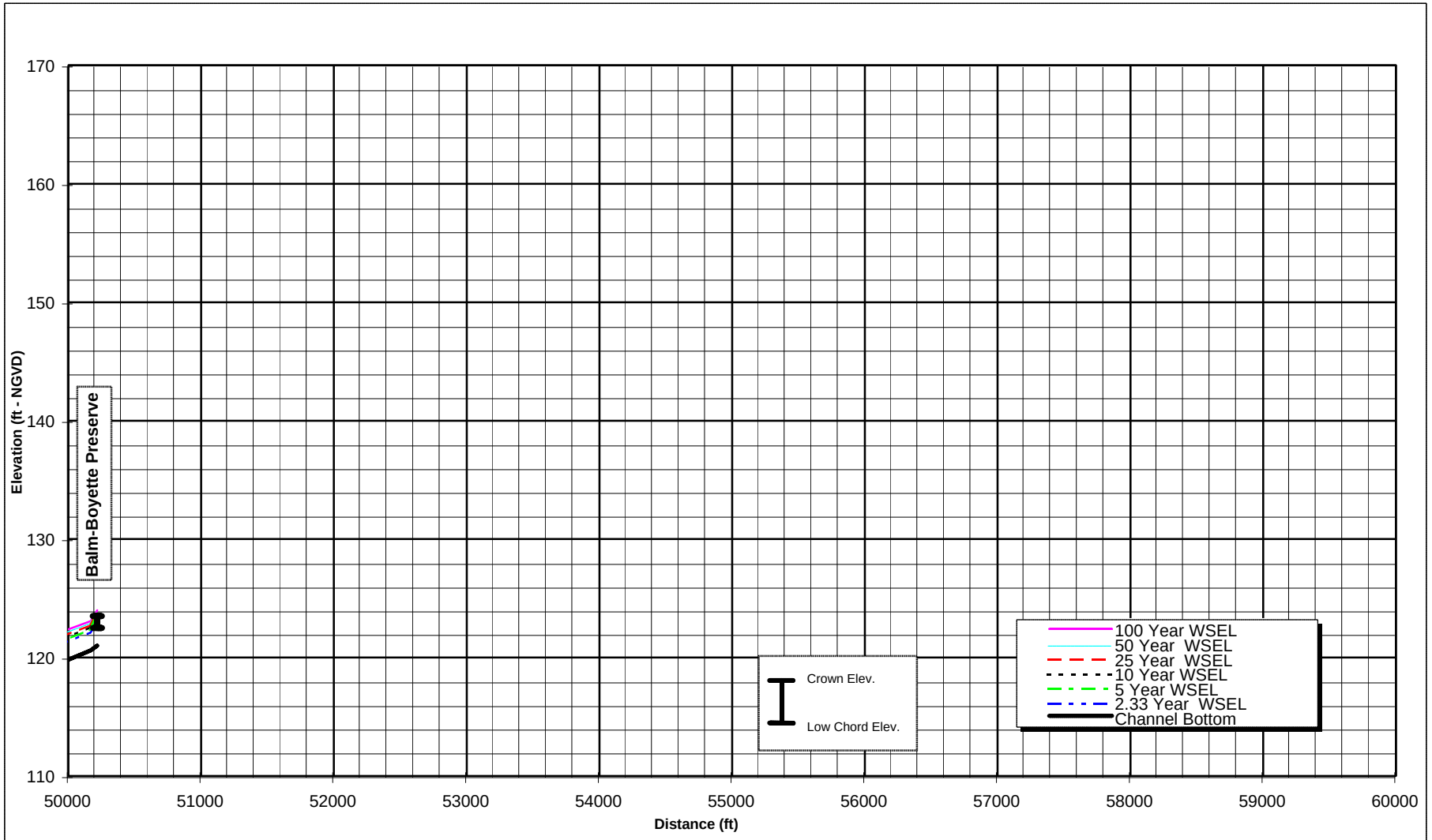
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Main Channel
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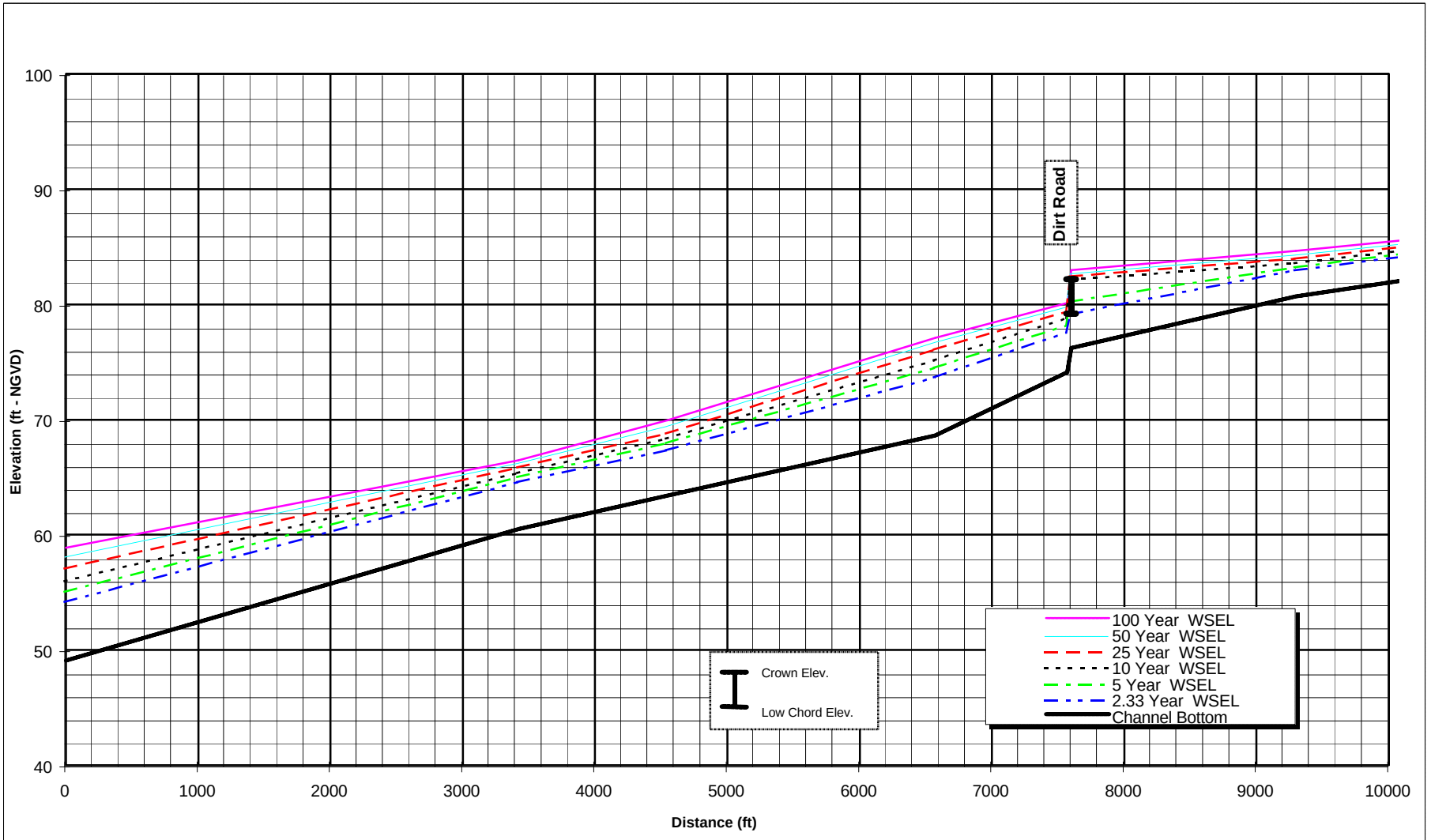
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-11
Fishhawk Creek / Main Channel
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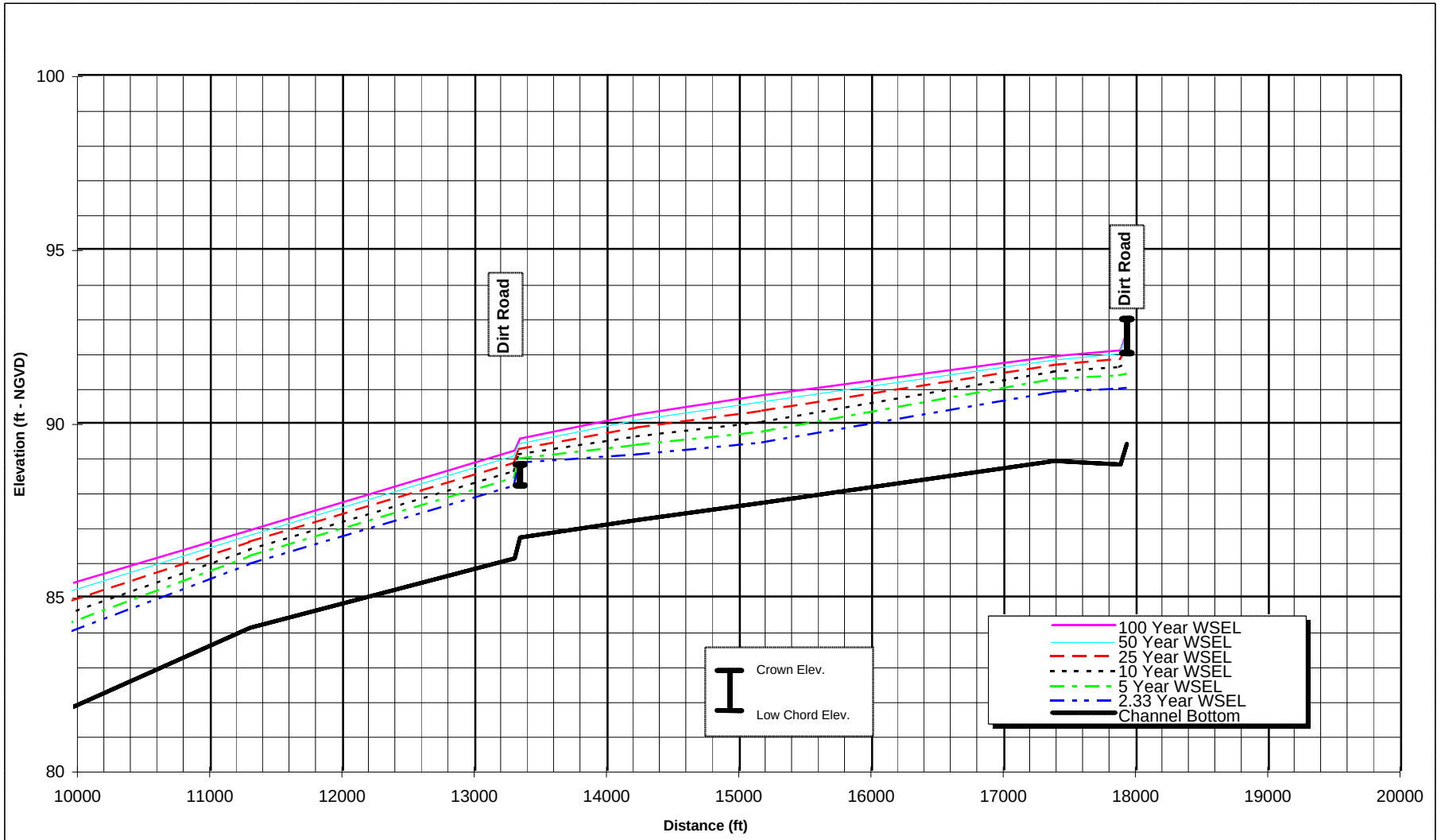
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Main Channel
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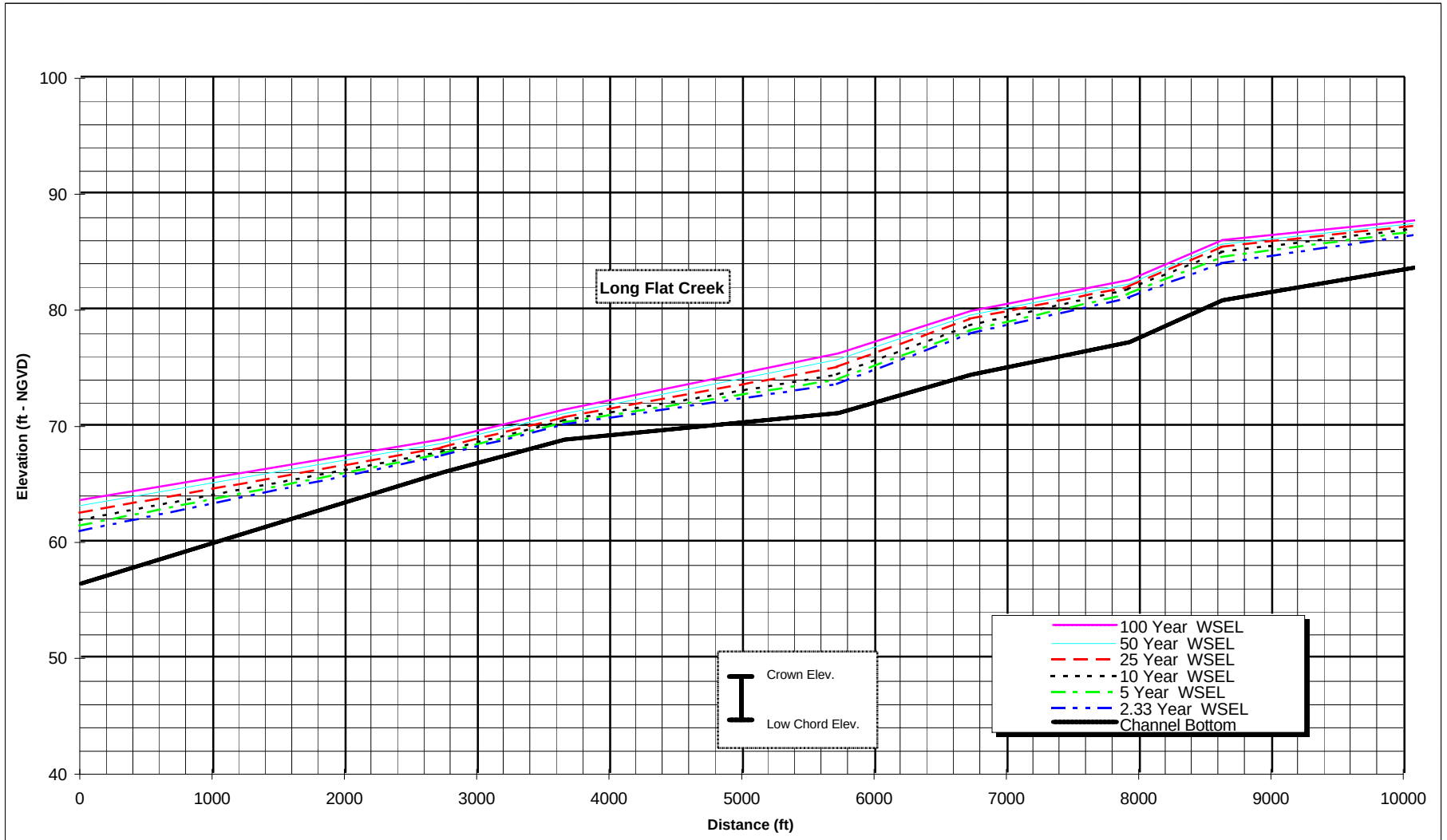
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Doe Branch
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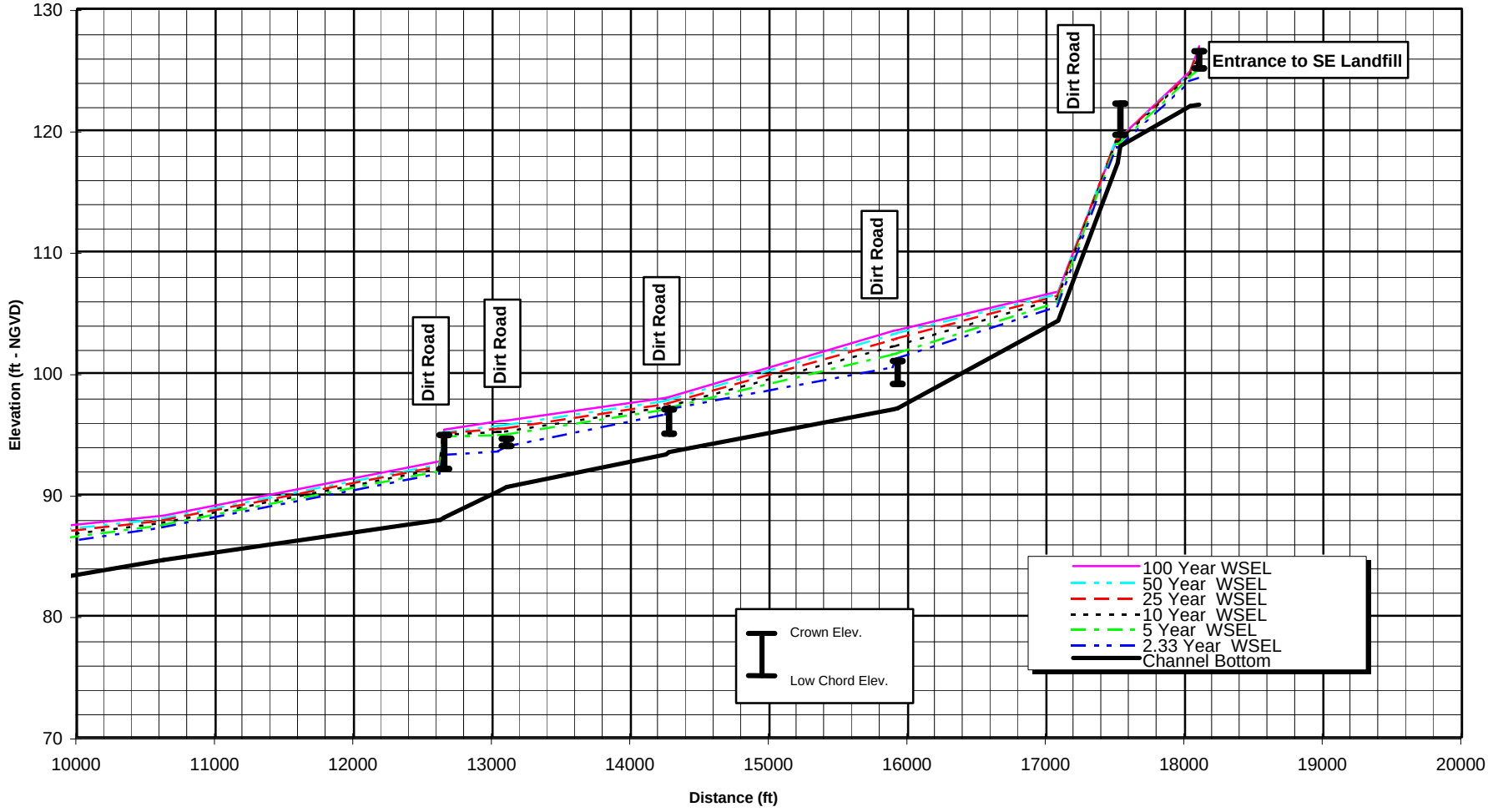
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Doe Branch
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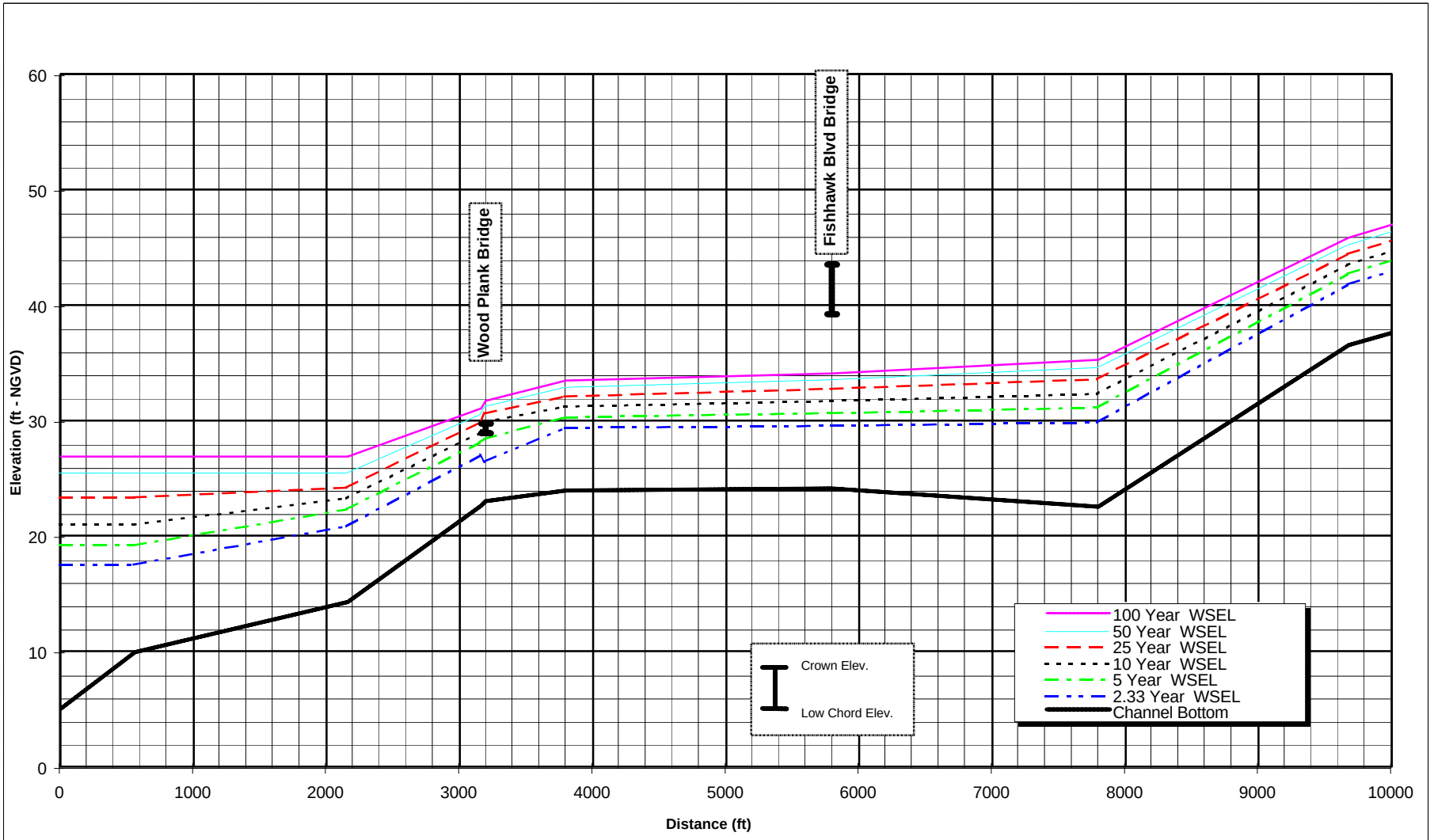
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Long Flat Creek
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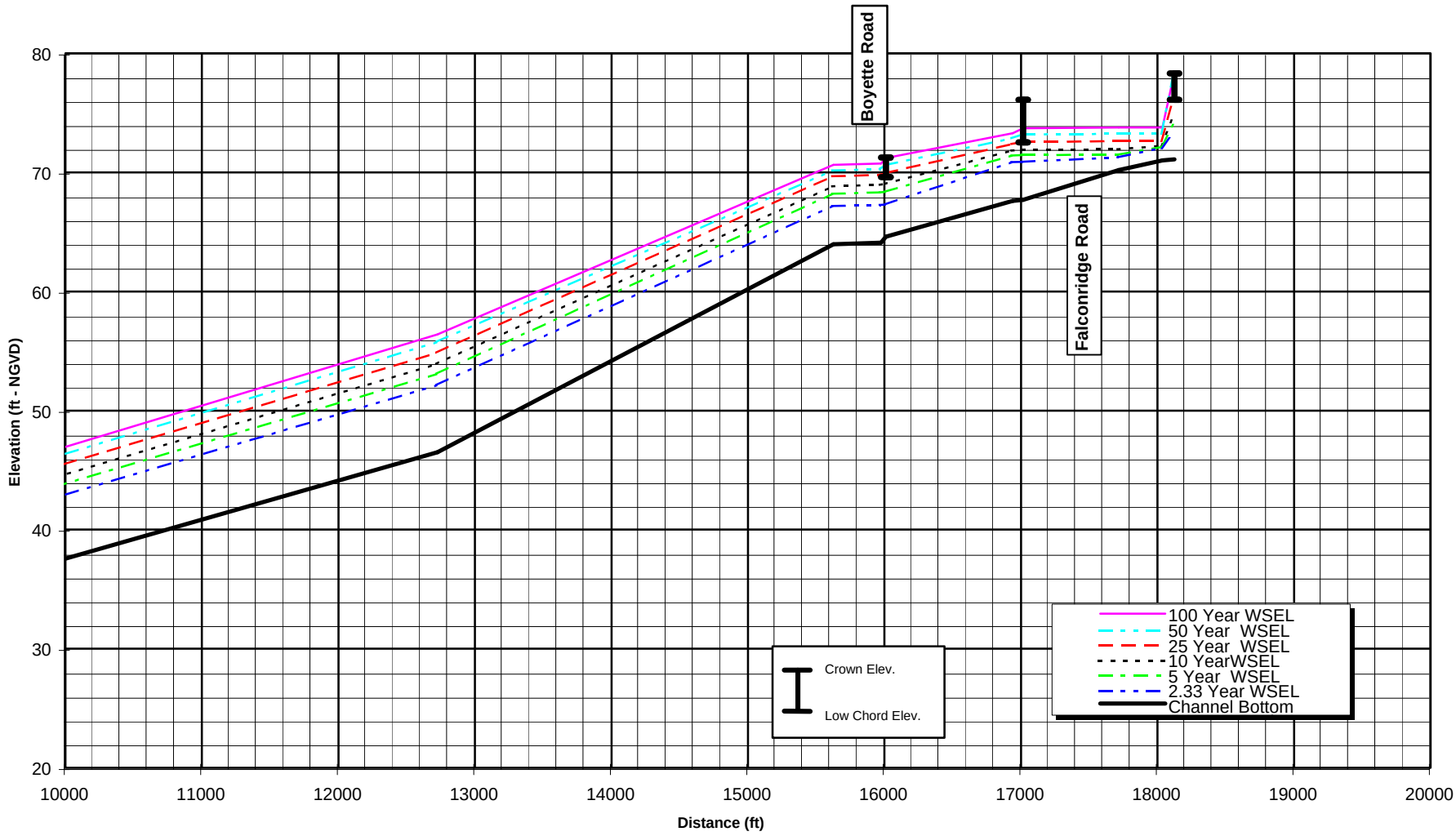
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Long Flat Creek
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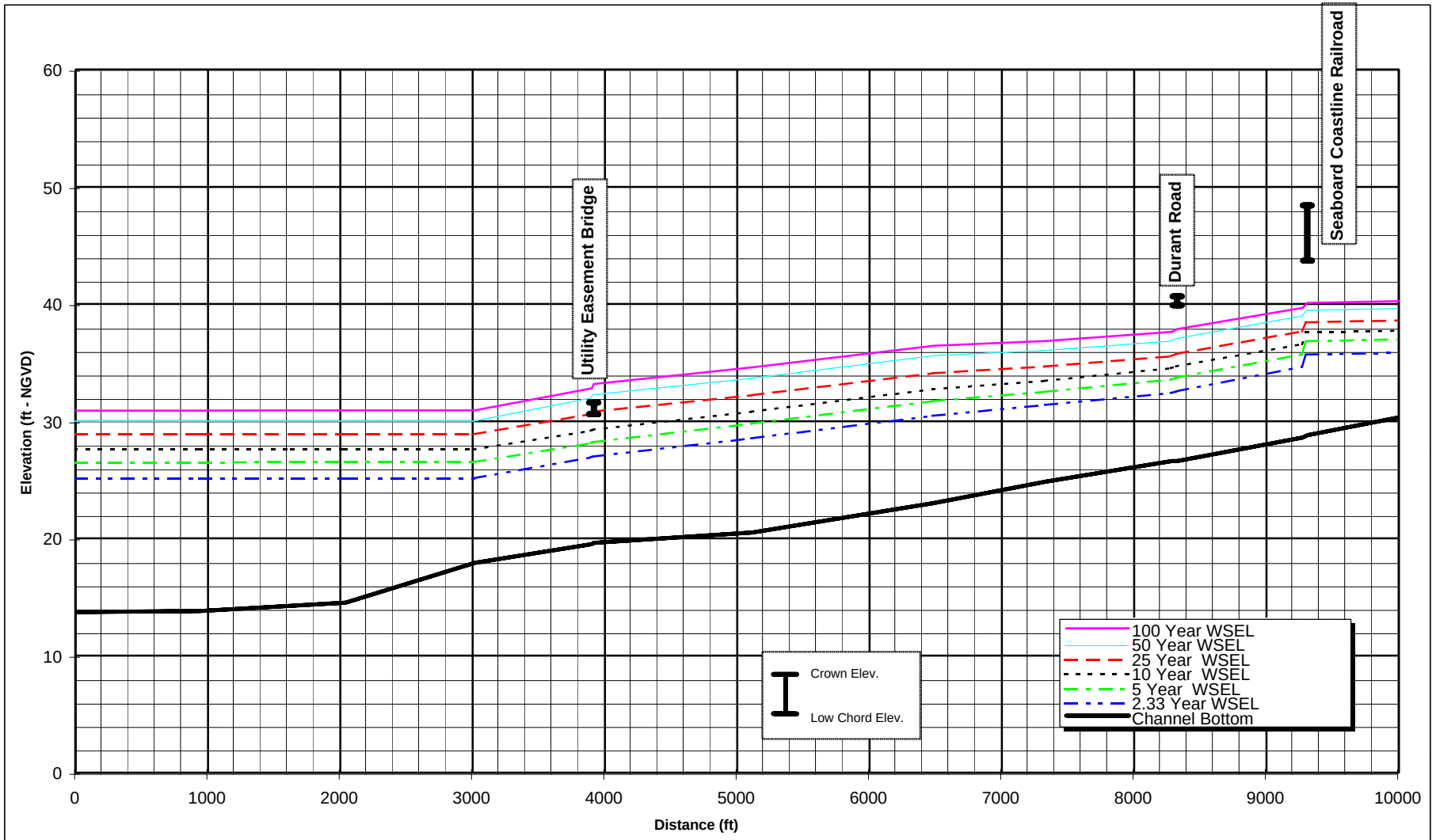
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Little Fishhawk Creek
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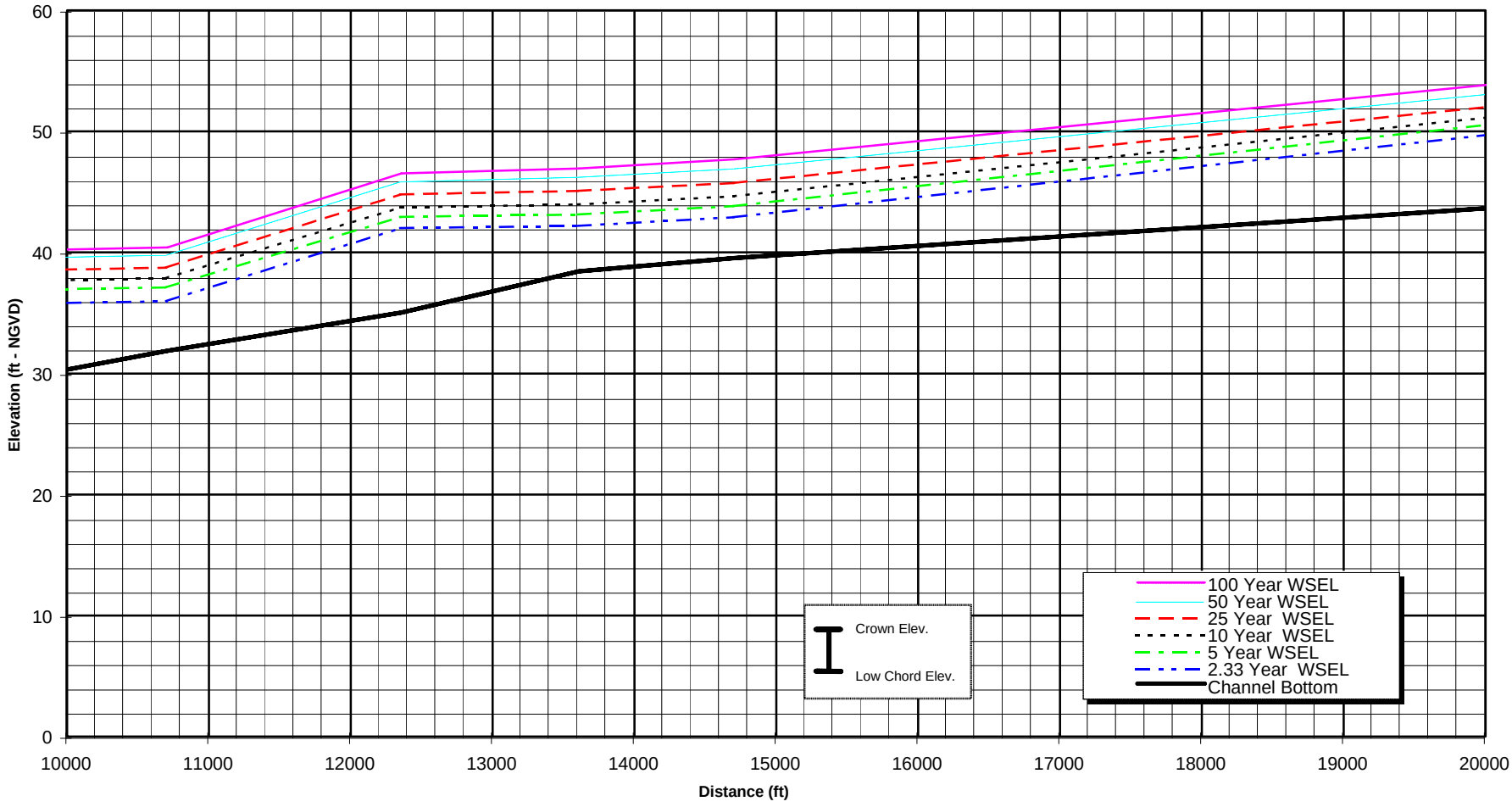
Fishhawk Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-11
Fishhawk Creek / Little Fishhawk Creek
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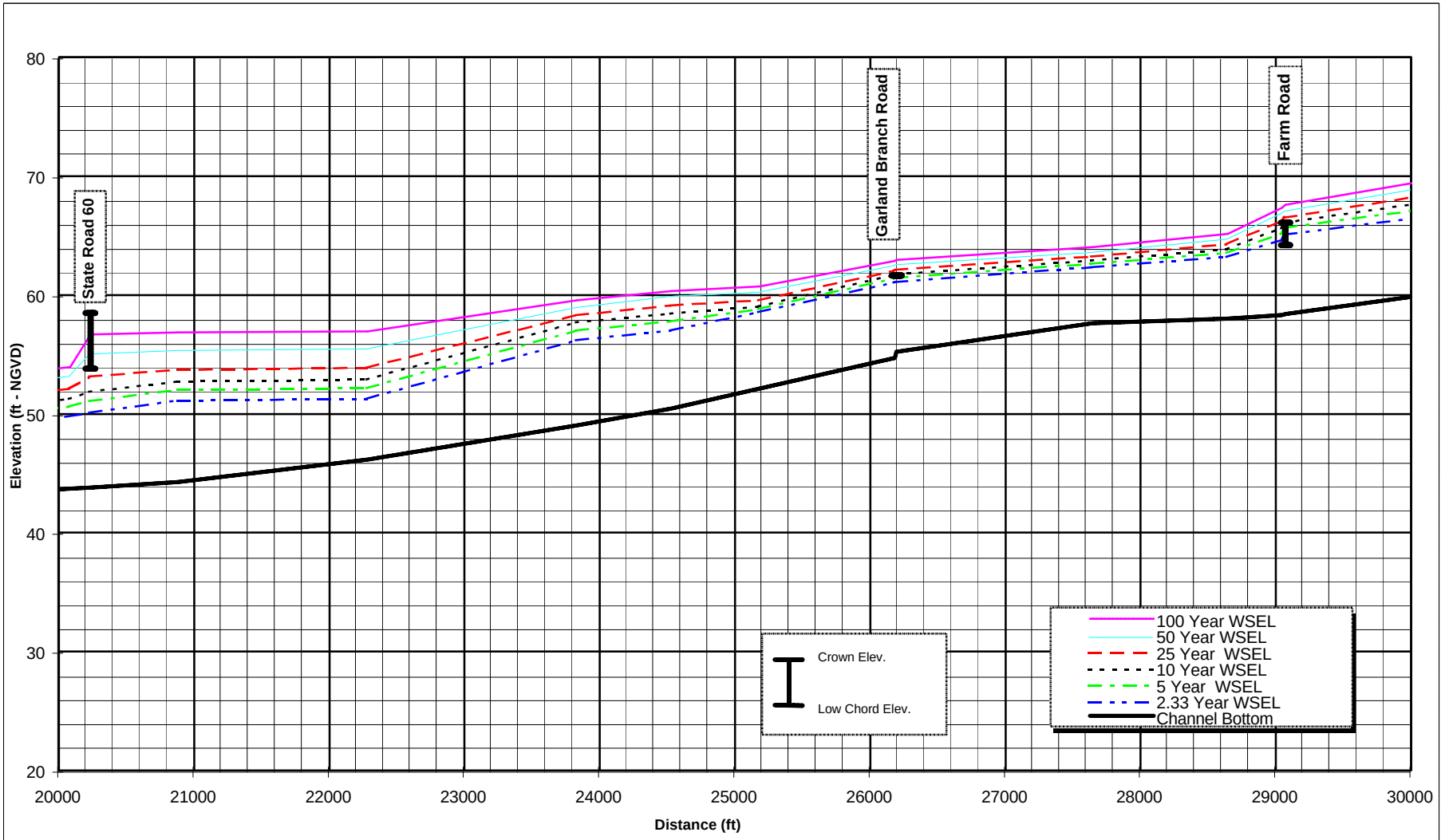
Turkey Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-12
Turkey Creek \ Main Channel
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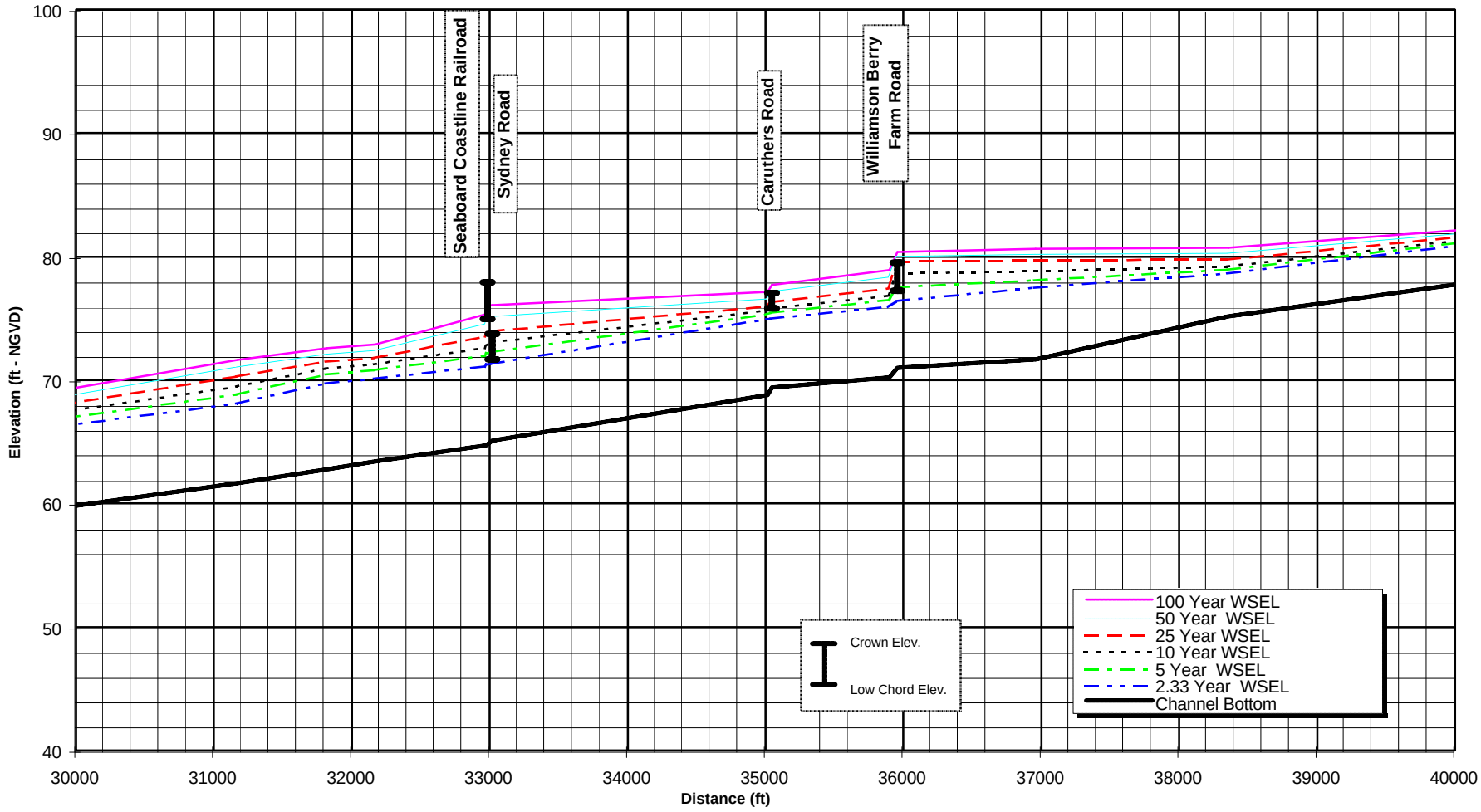
Turkey Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-12
Turkey Creek \ Main Channel
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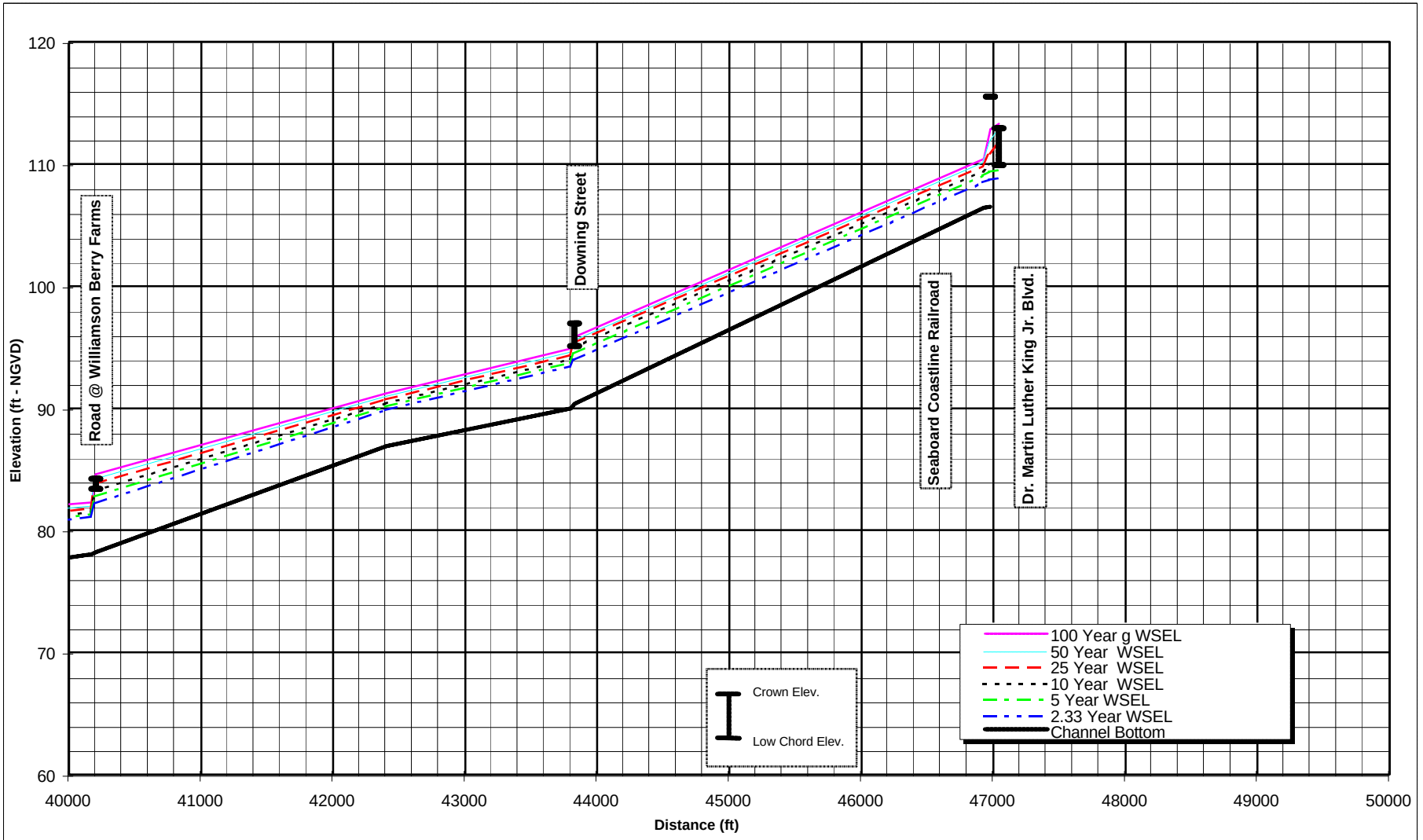
Turkey Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-12
Turkey Creek \ Main Channel
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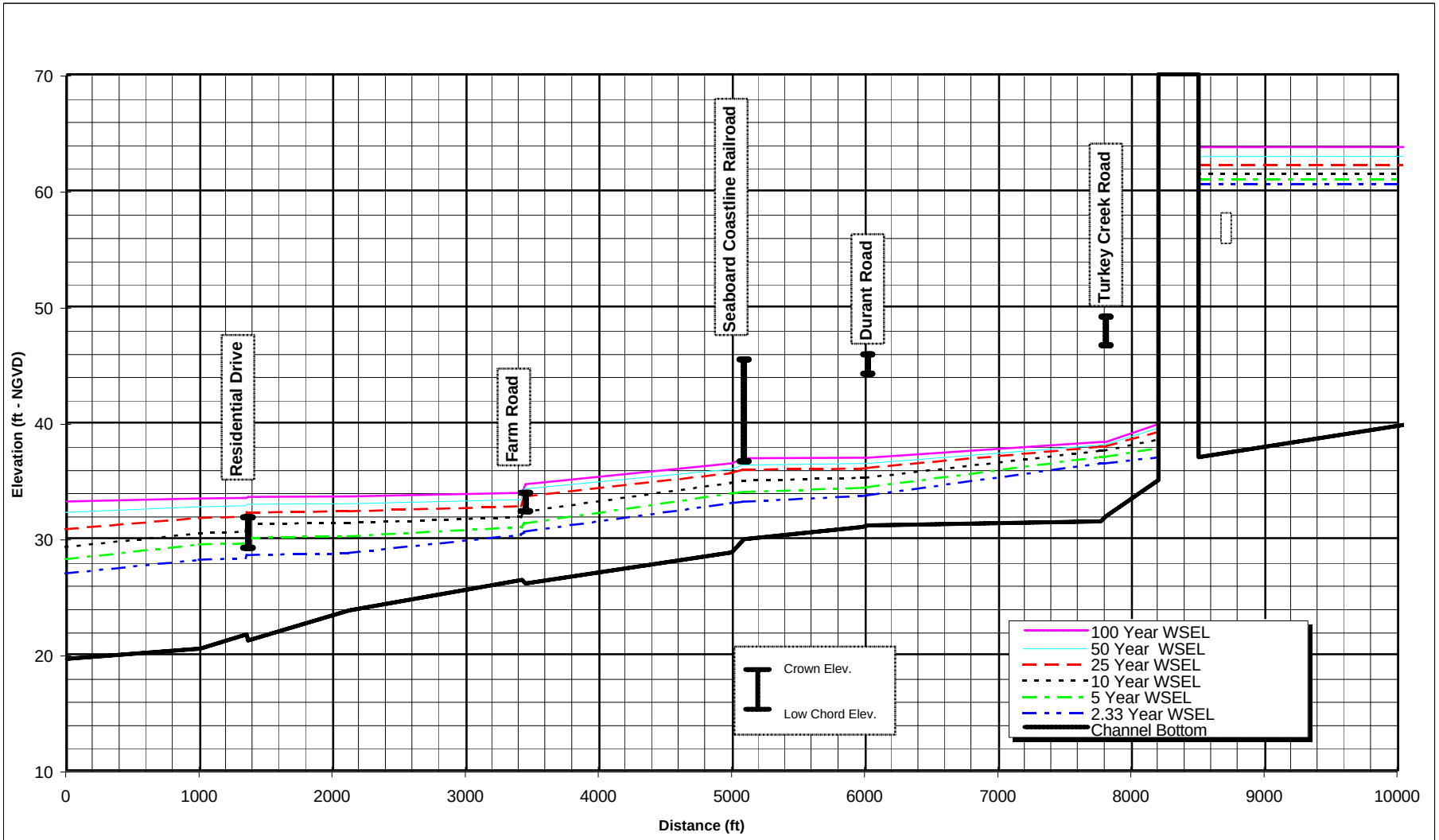
Turkey Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-12
Turkey Creek \ Main Channel
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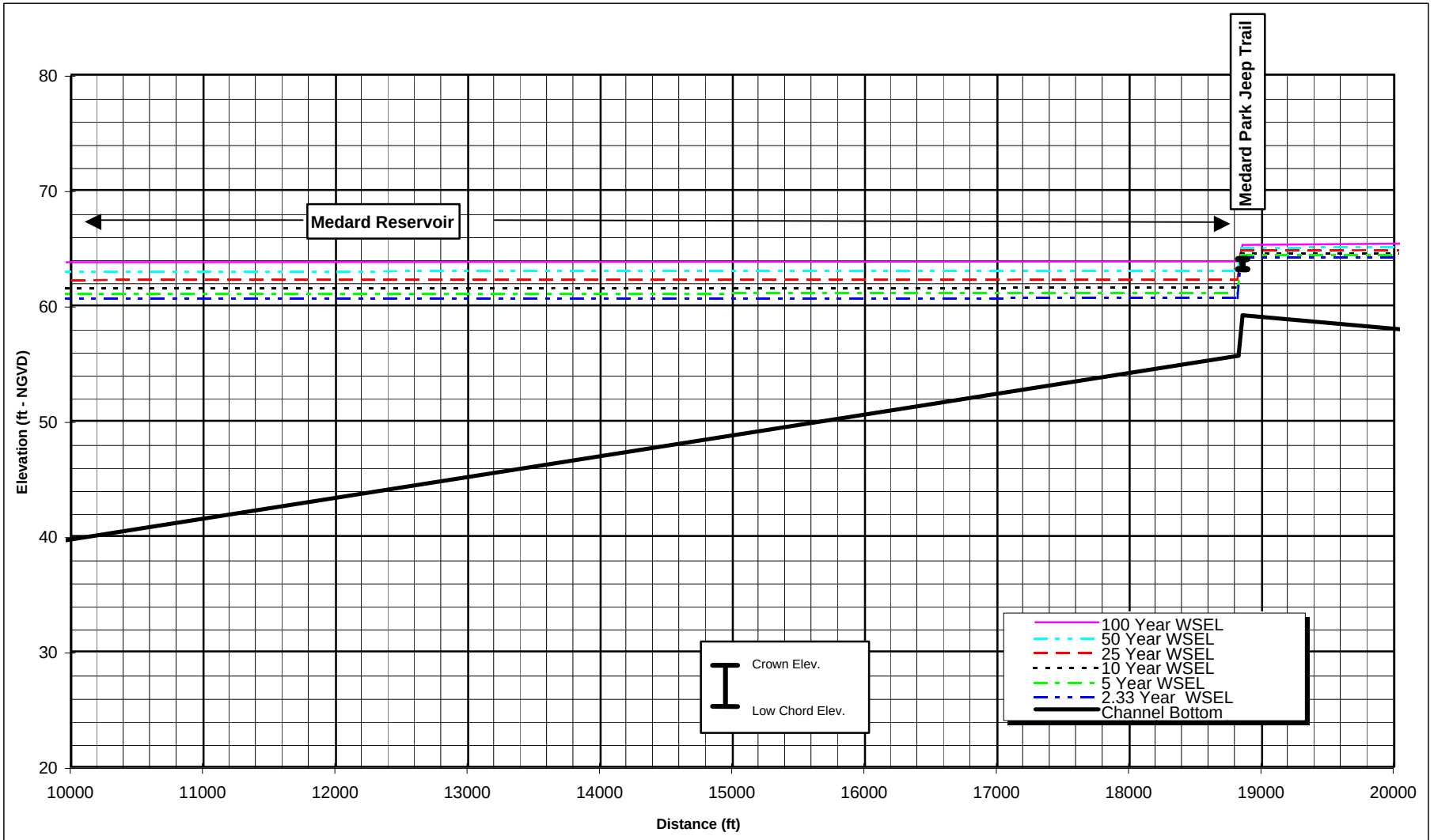
Turkey Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-12
Turkey Creek \ Main Channel
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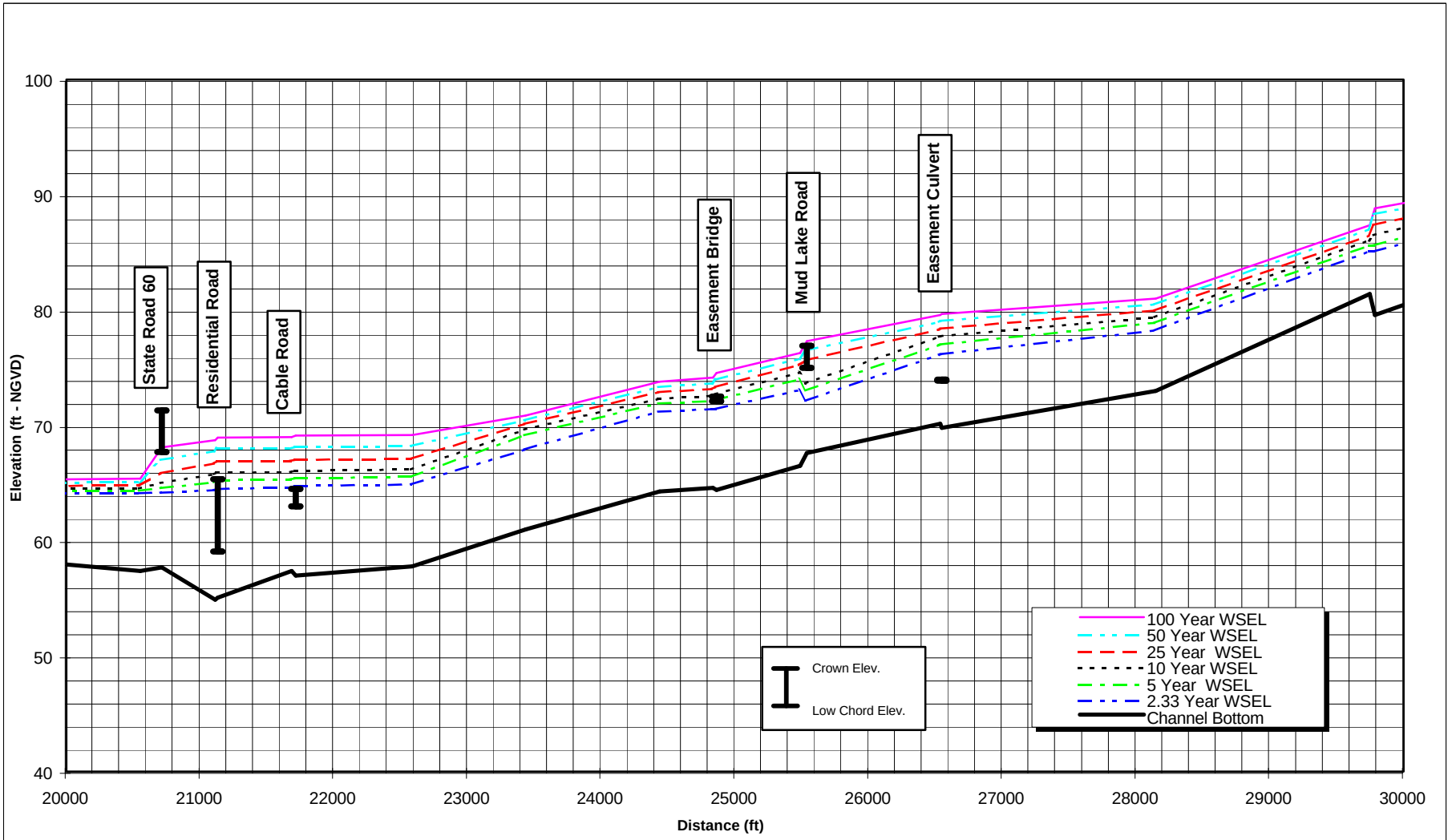
Turkey Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-12
Turkey Creek \ Little Alafia River
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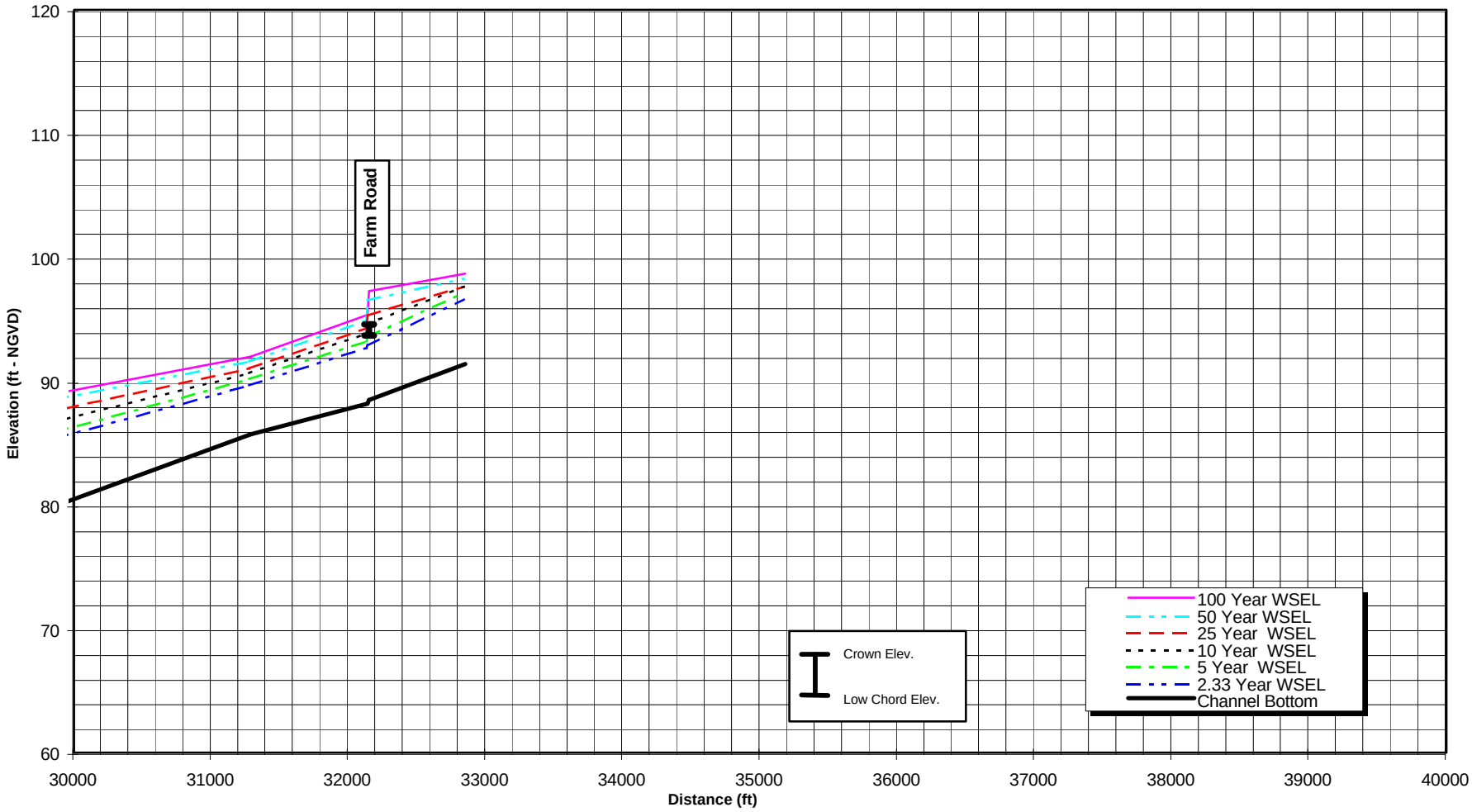
Turkey Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-12
Turkey Creek \ Little Alafia River
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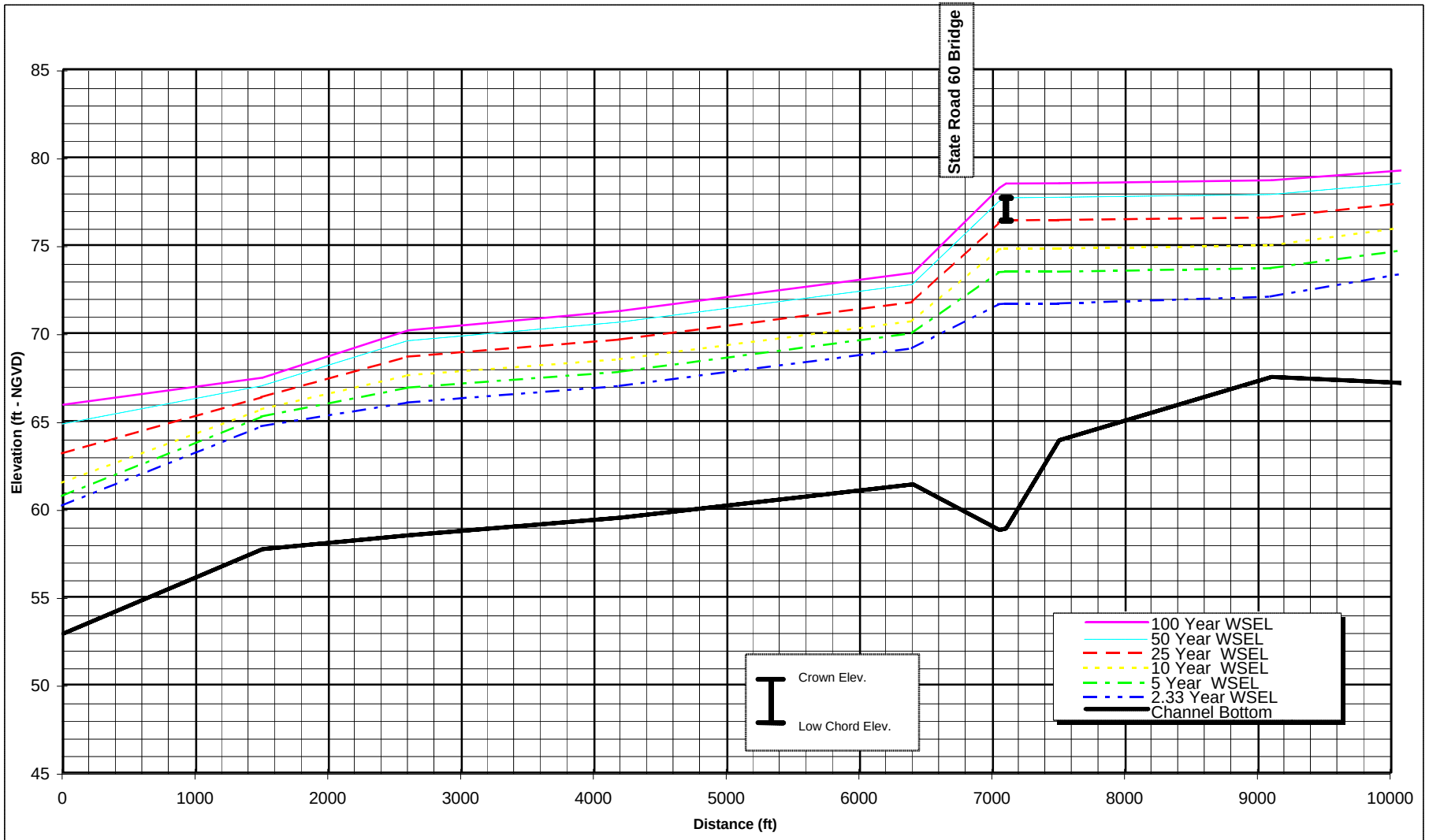
Turkey Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-12
Turkey Creek \ Little Alafia River
Sheet 8 of 9



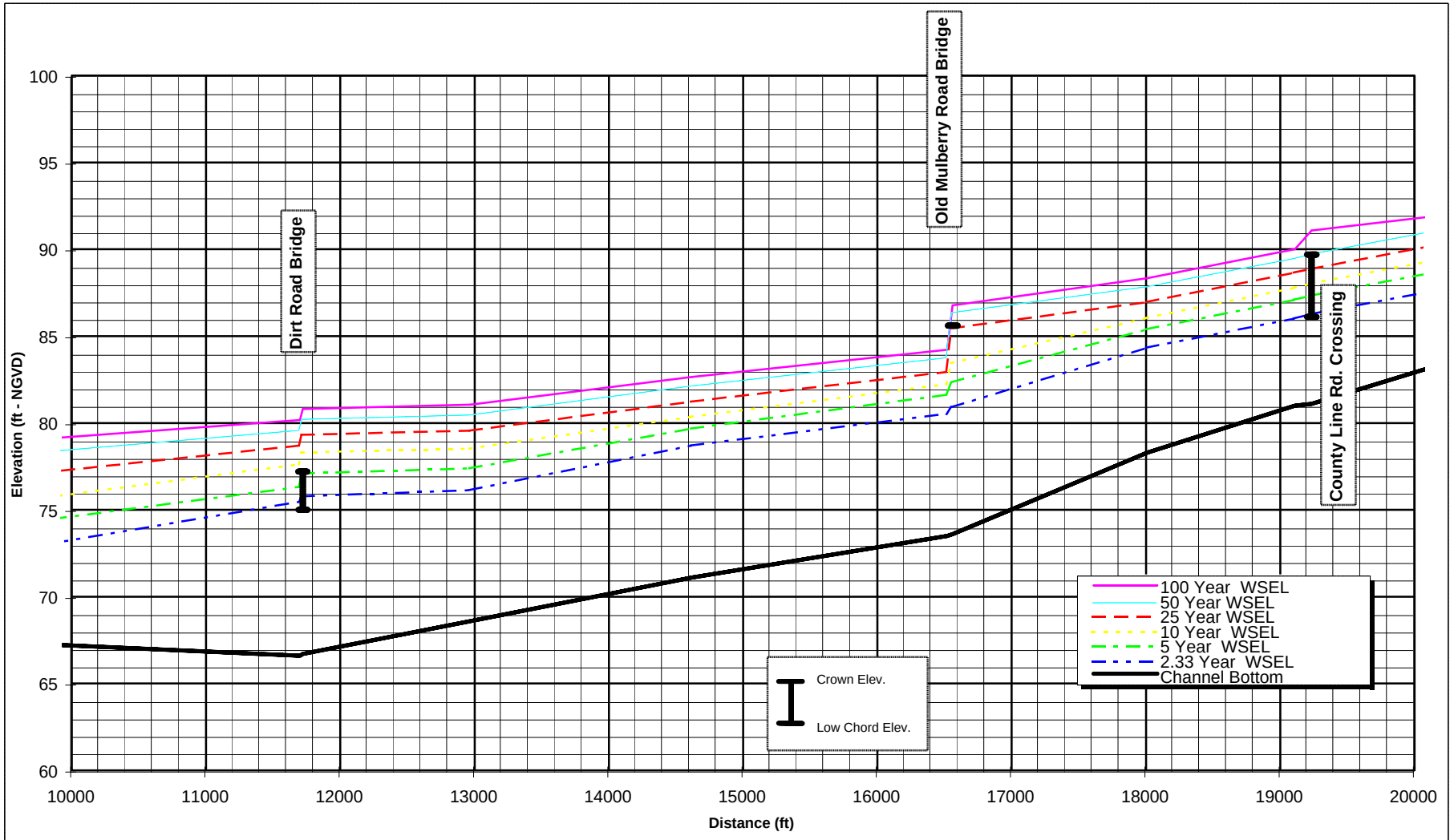
Turkey Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-12
Turkey Creek \ Little Alafia River
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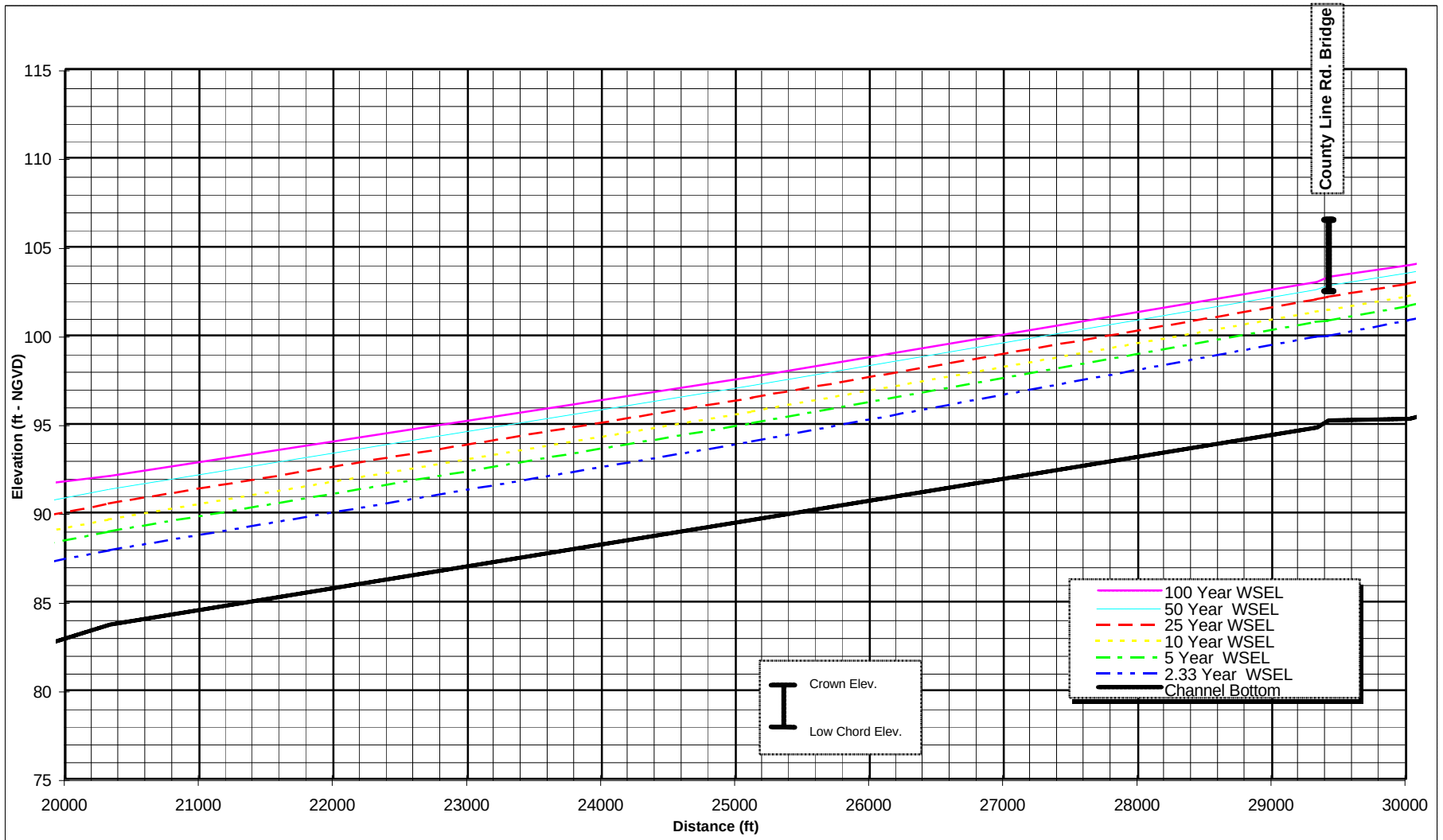
English Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-13
English Creek \ Main Channel
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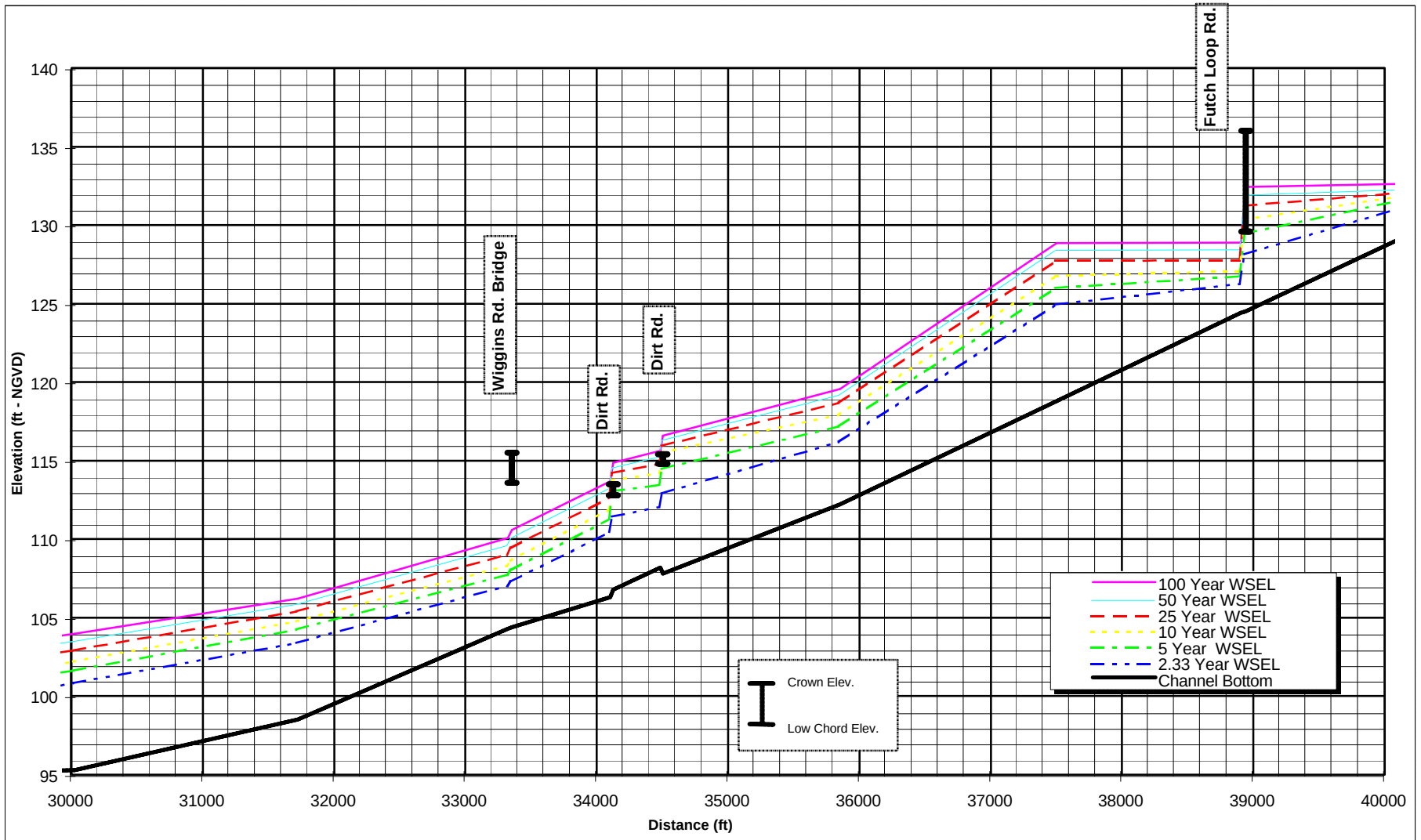
English Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-13
English Creek \ Main Channel
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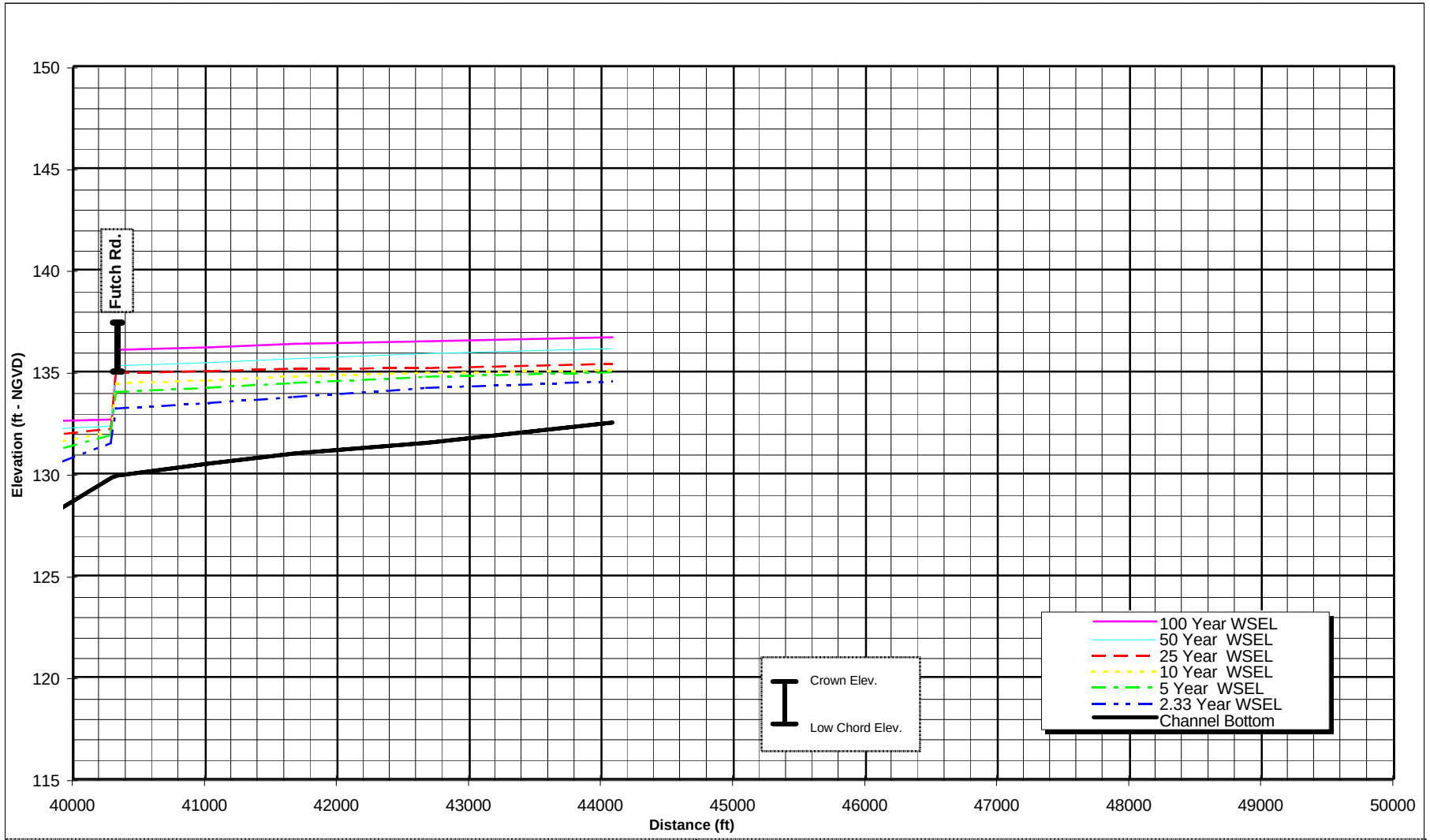
English Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-13
English Creek \ Main Channel
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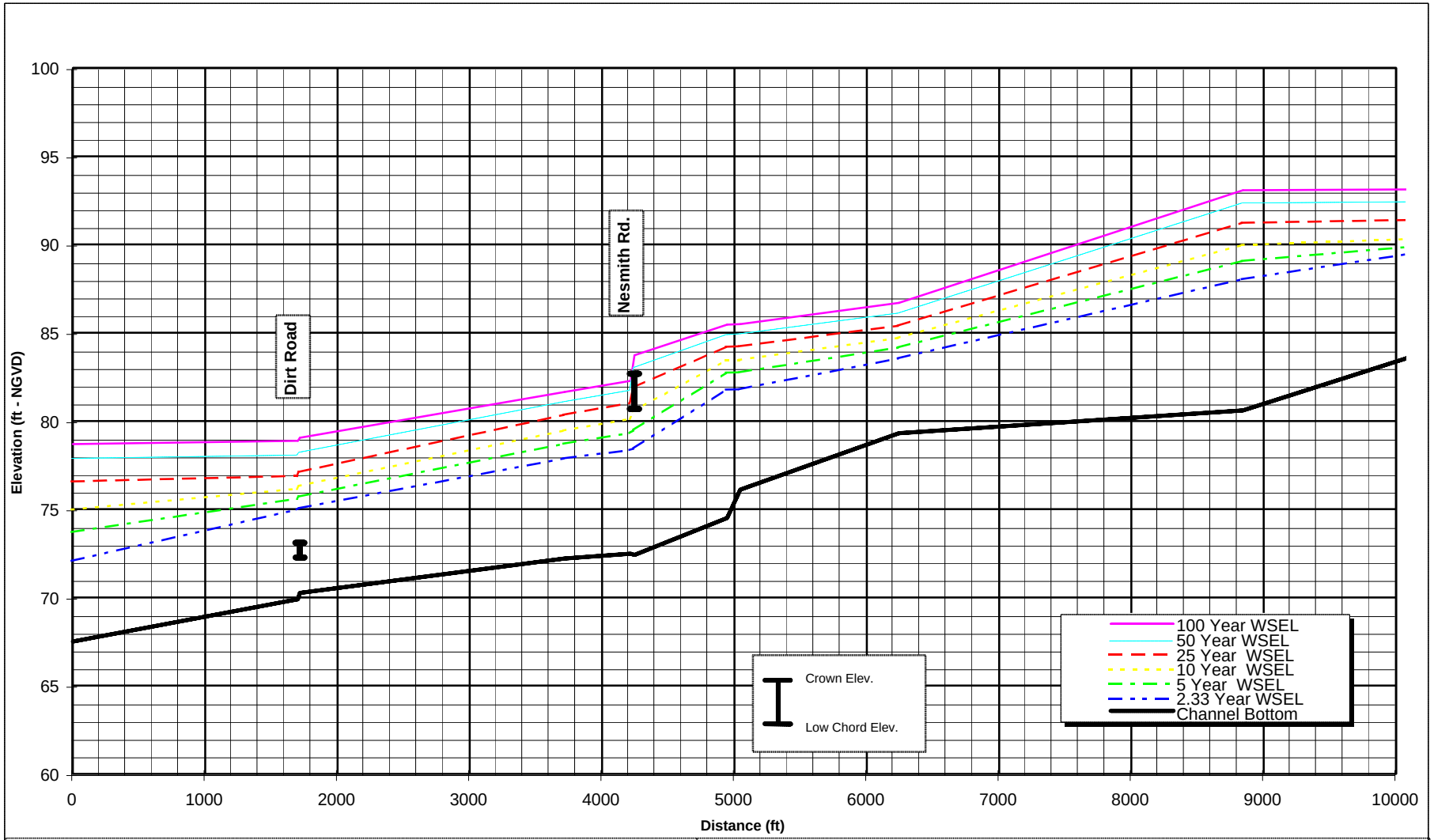
English Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-13
English Creek \ Main Channel
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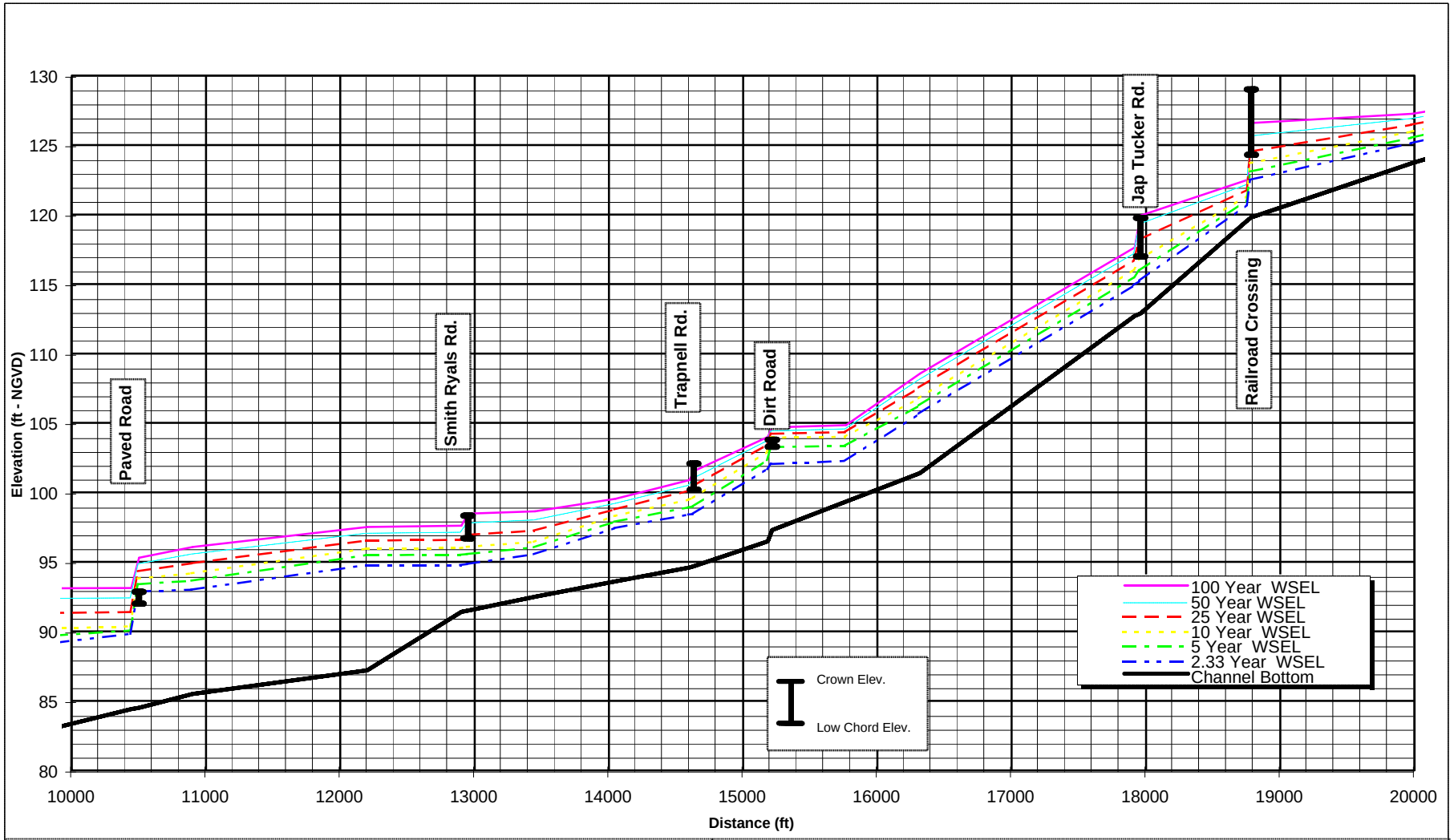
English Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-13
English Creek \ Main Channel
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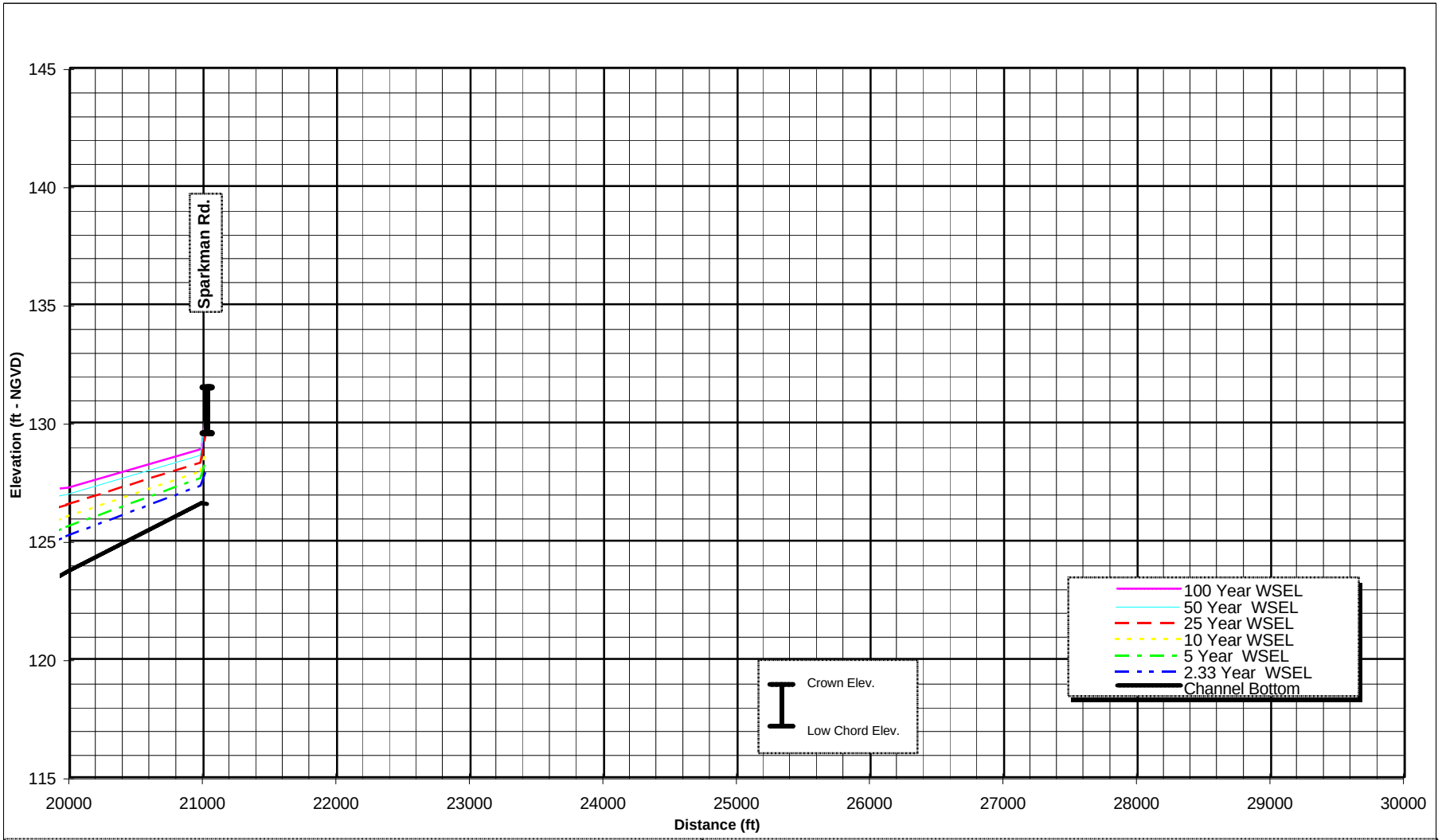
English Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-13
English Creek \ Howell Main Branch
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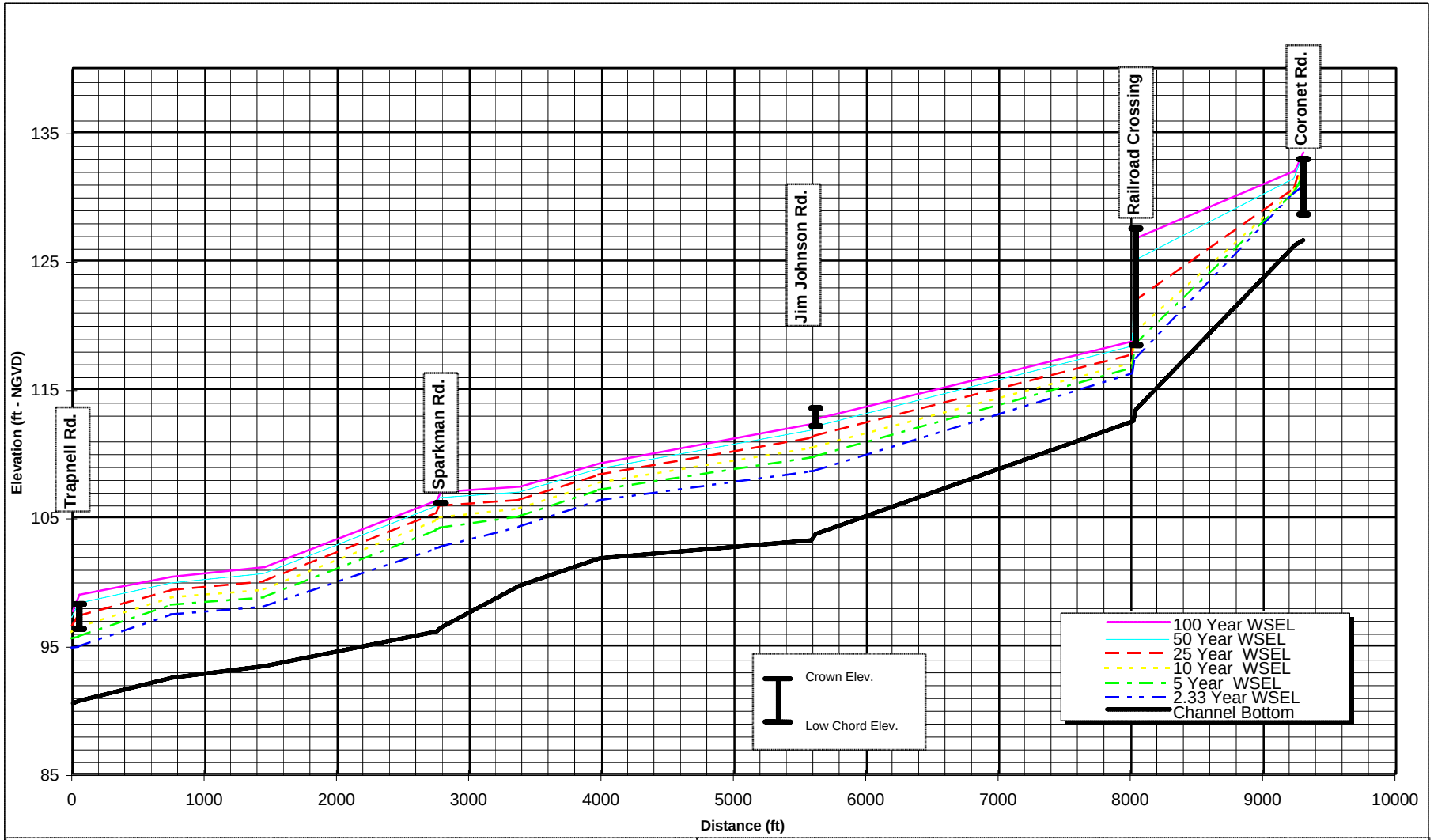
English Creek Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-13
English Creek \ Howell Main Branch
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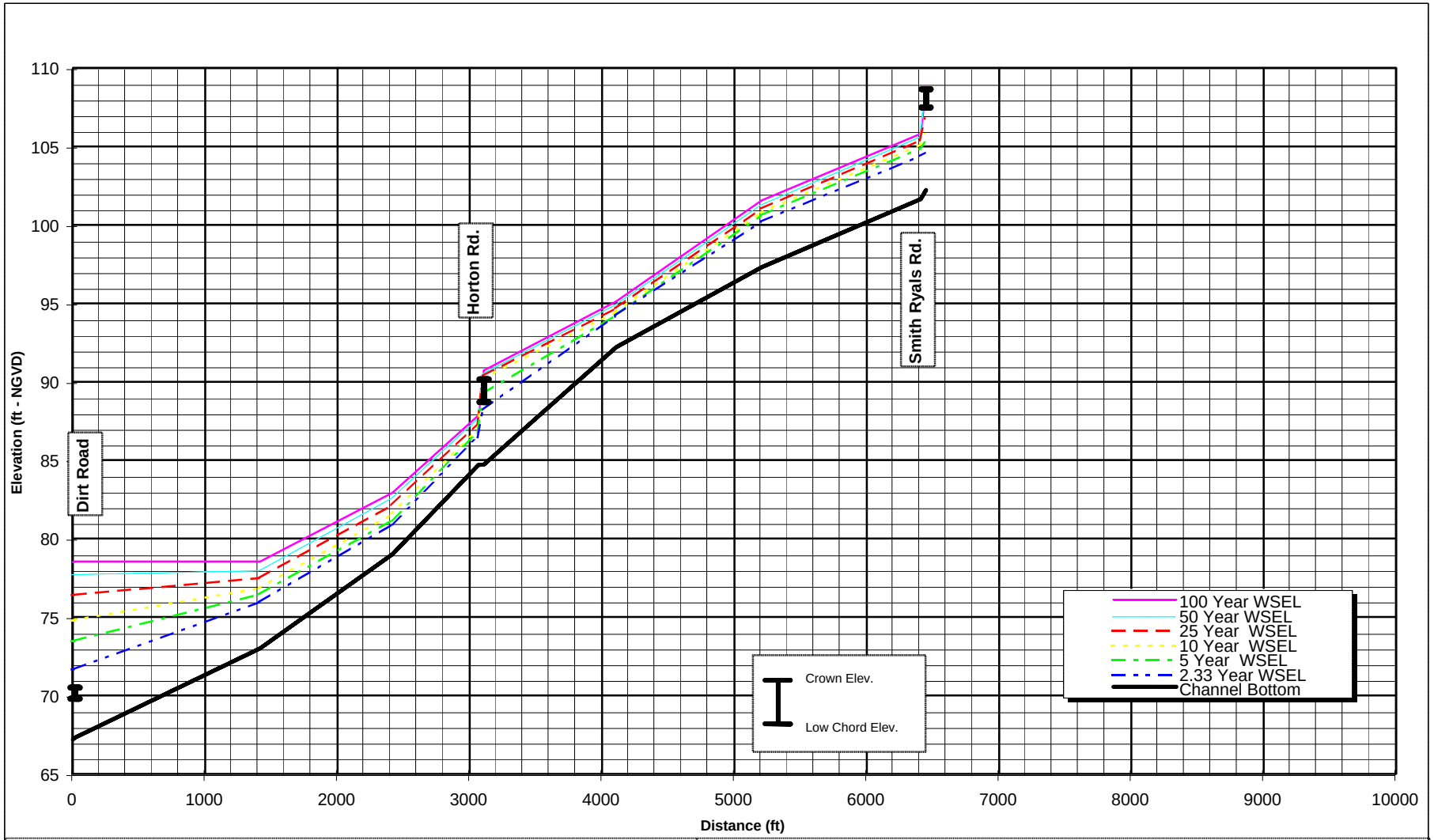
English Creek Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-13
English Creek \ Howell Main Branch
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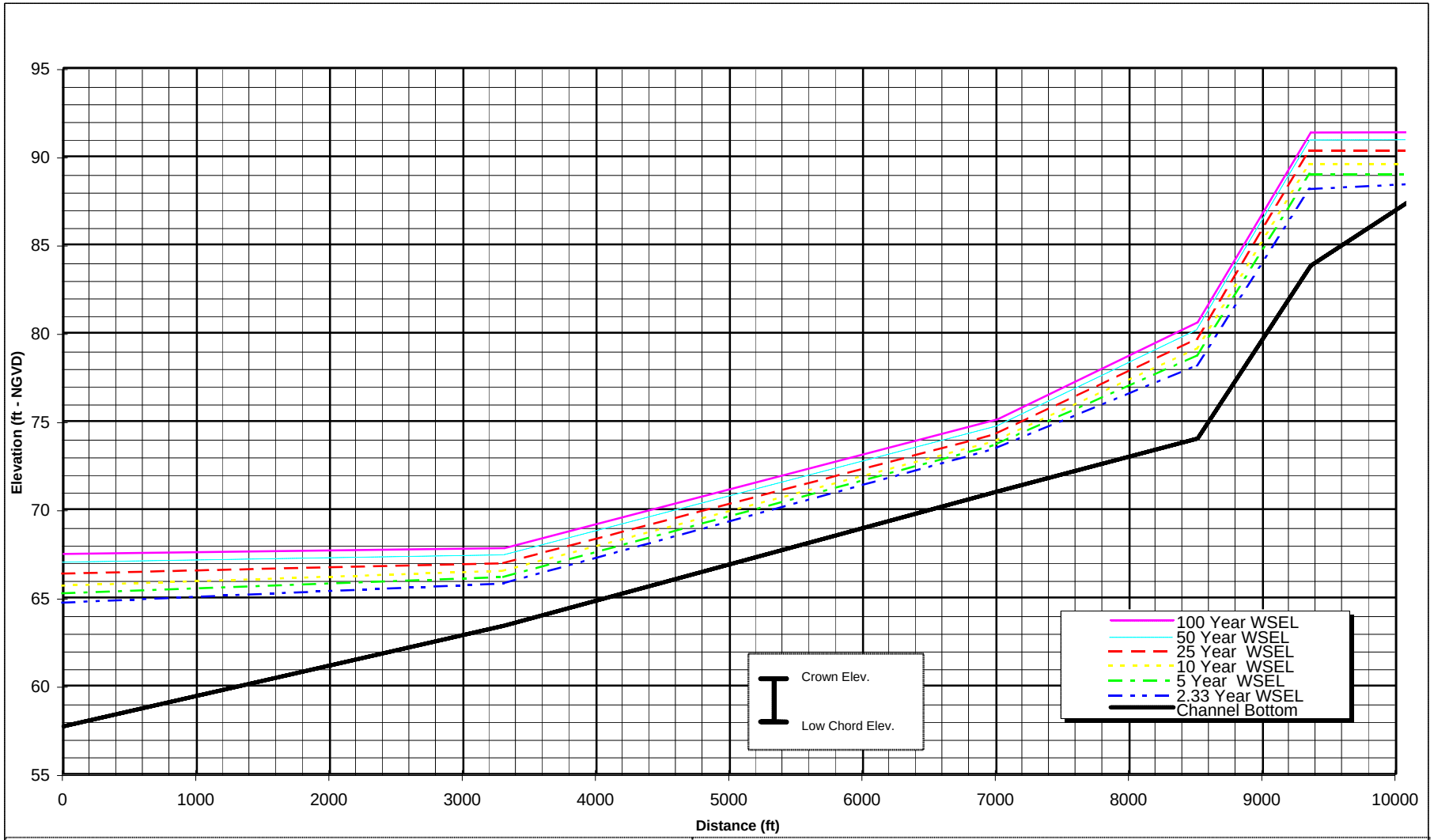
English Creek Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-13
English Creek \ Howell Creek
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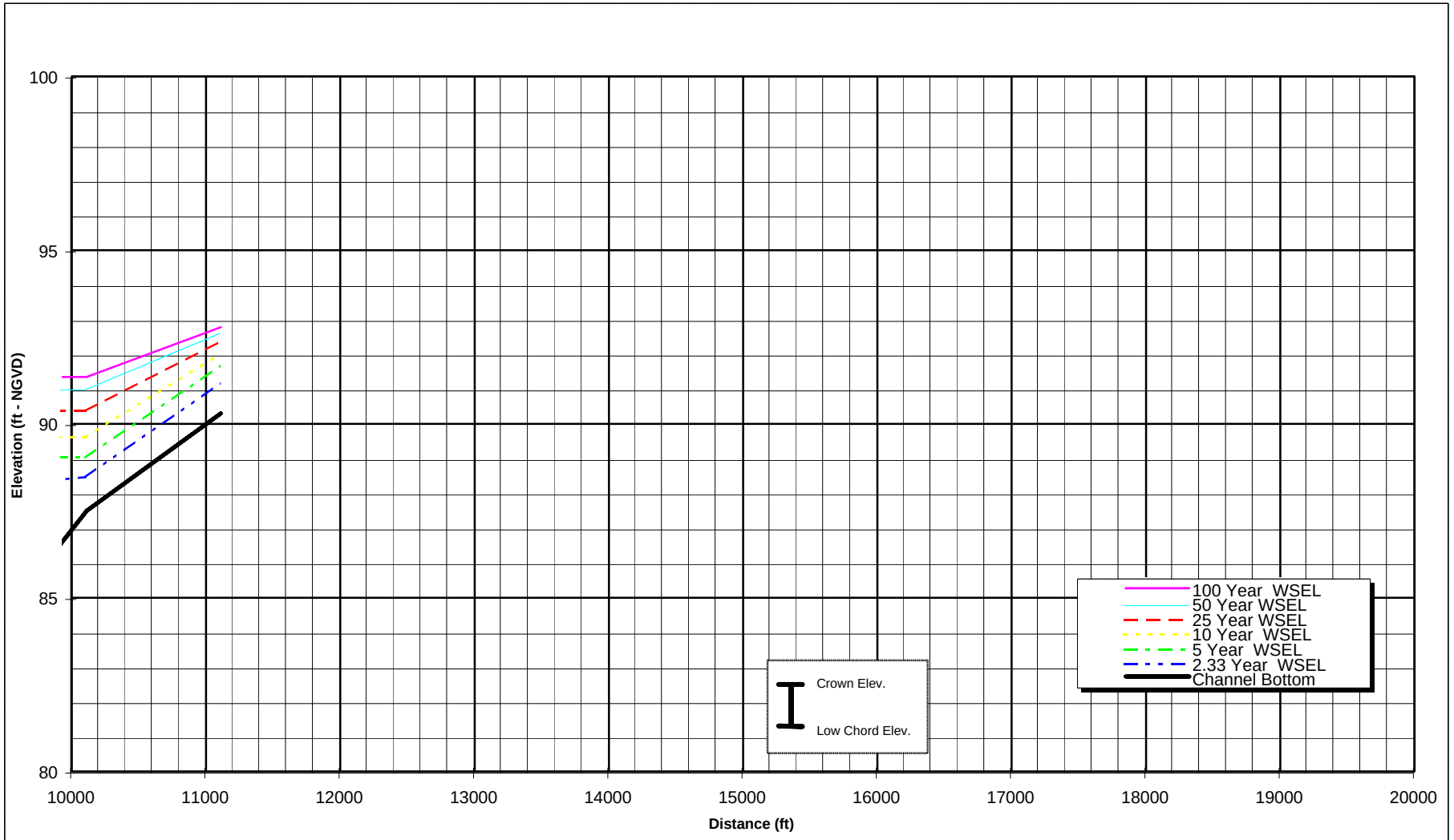
English Creek Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-13
English Creek \ Sam Hicks Branch
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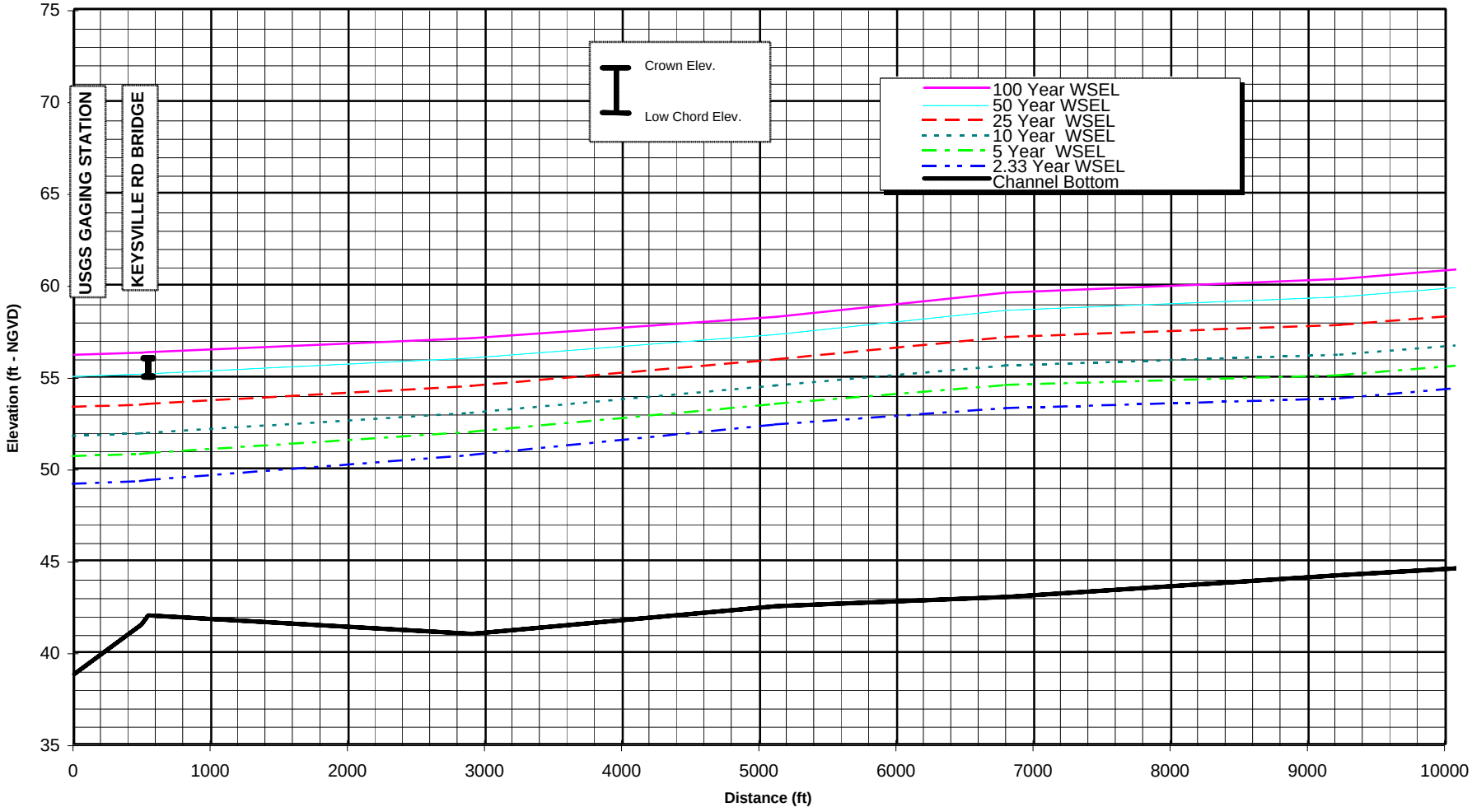
English Creek Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-13
English Creek \ Horton Branch
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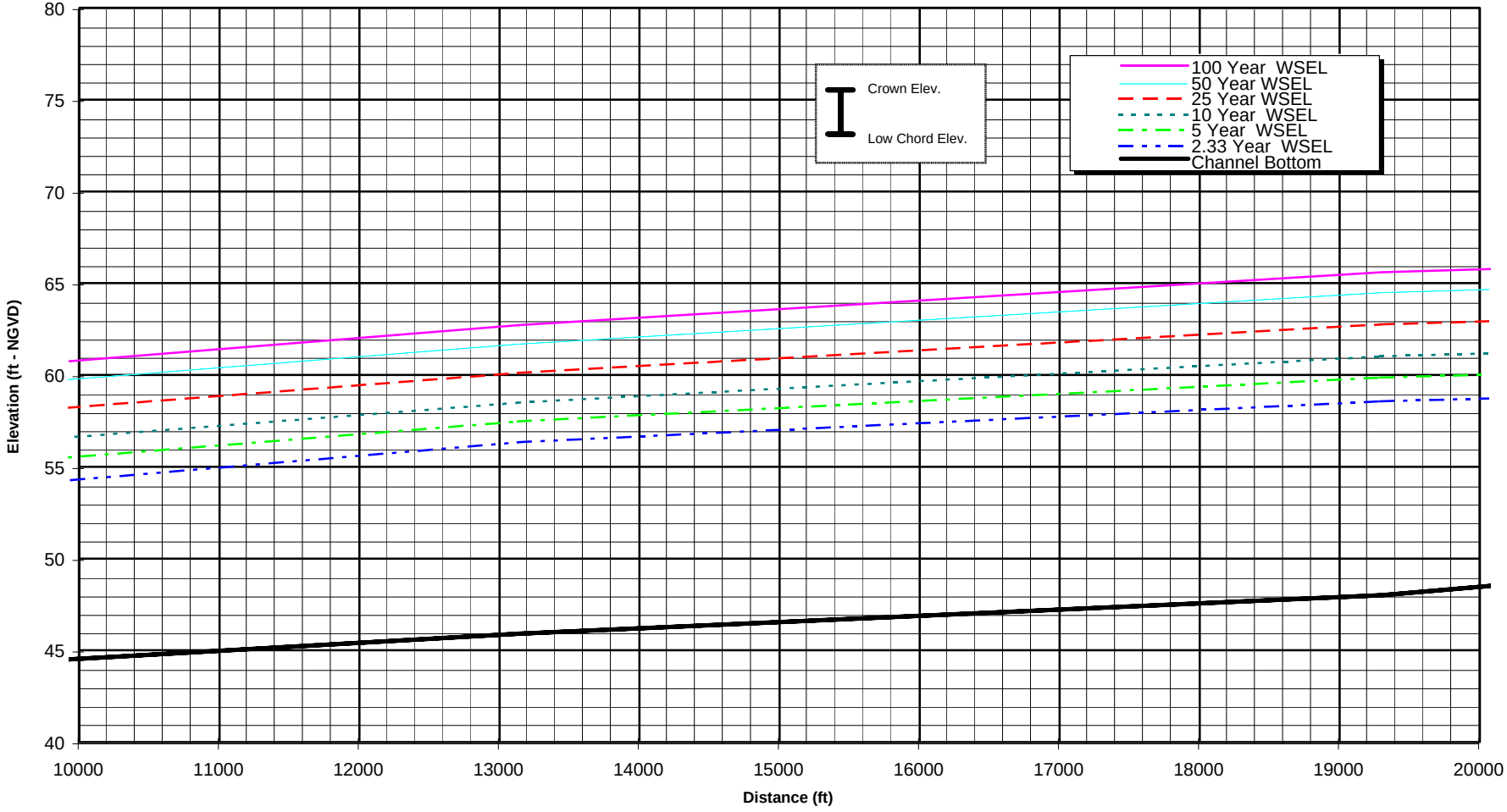
English Creek Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-13
English Creek \ Horton Branch
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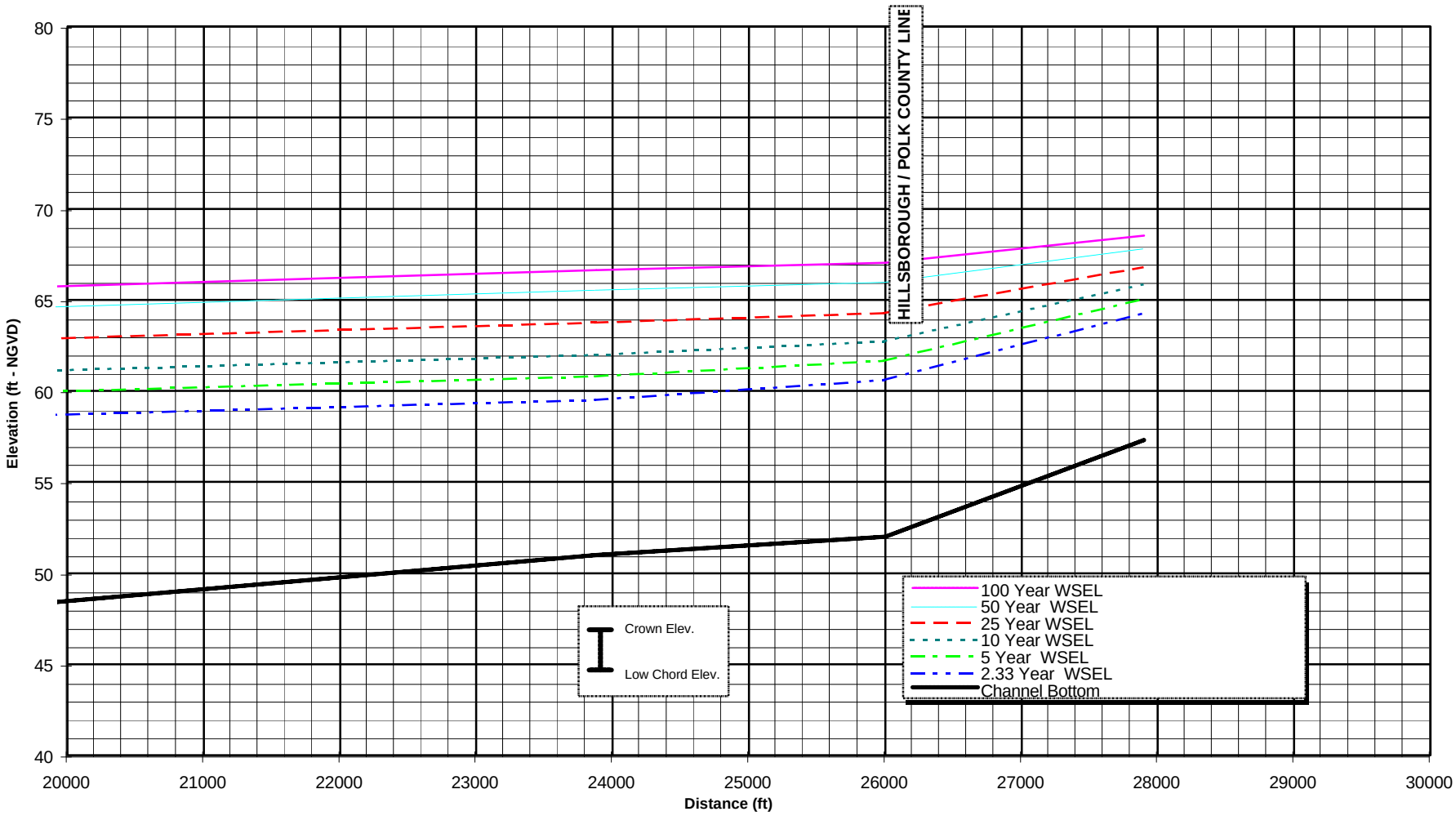
North Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-14
North Prong Alafia River \ Main Channel
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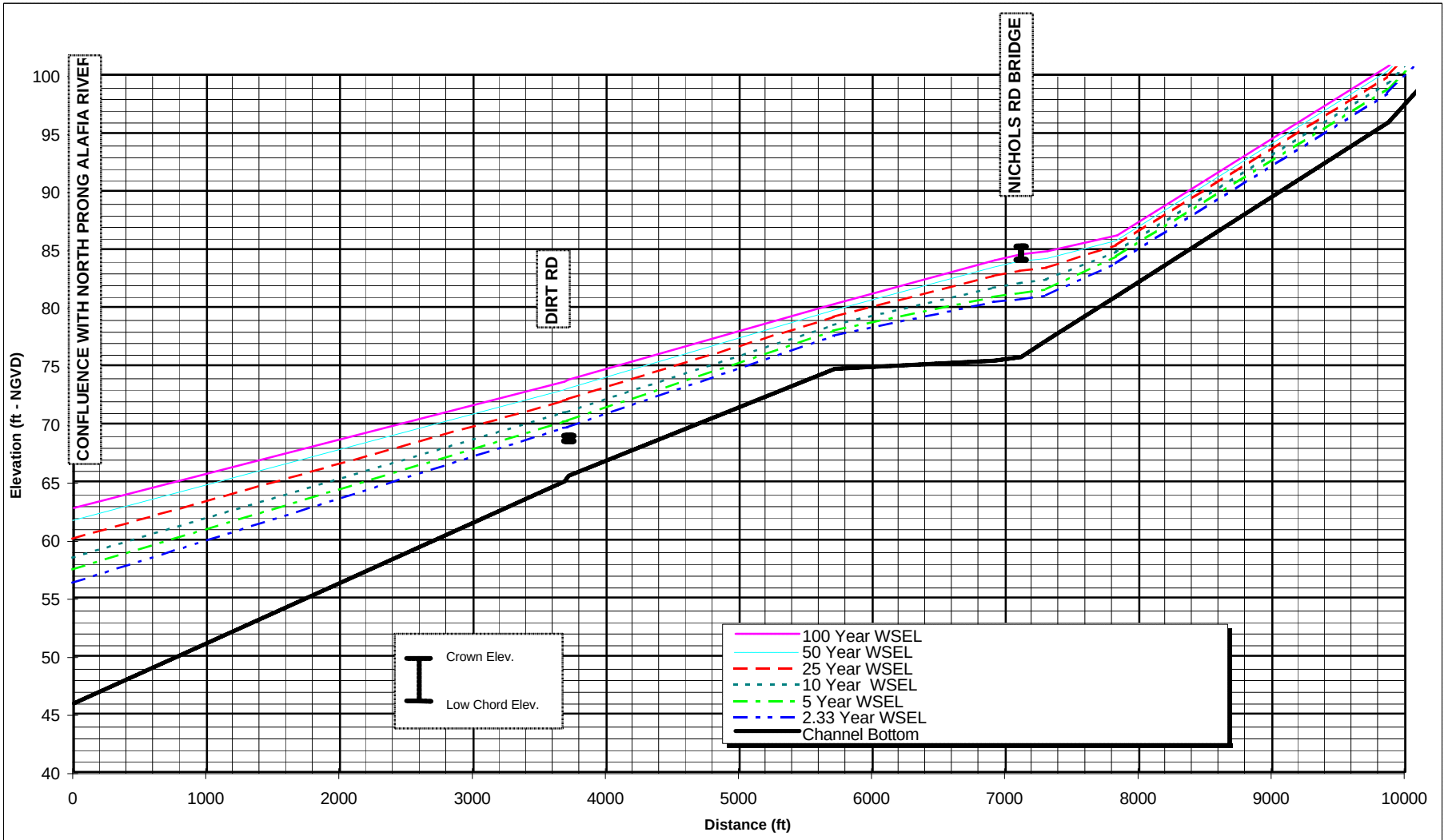
North Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-14
North Prong Alafia River \ Main Channel
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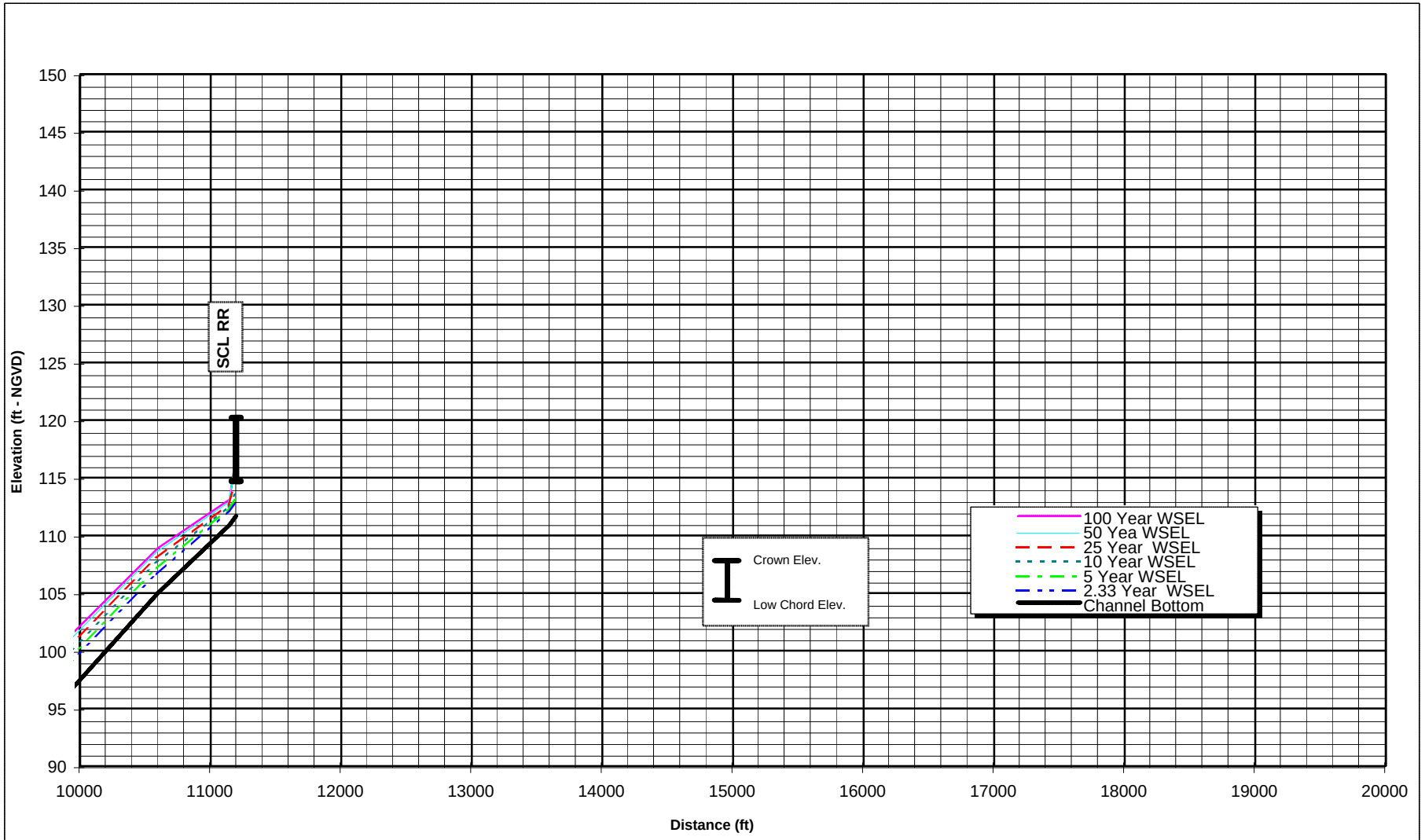
North Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-14
North Prong Alafia River \ Main Channel
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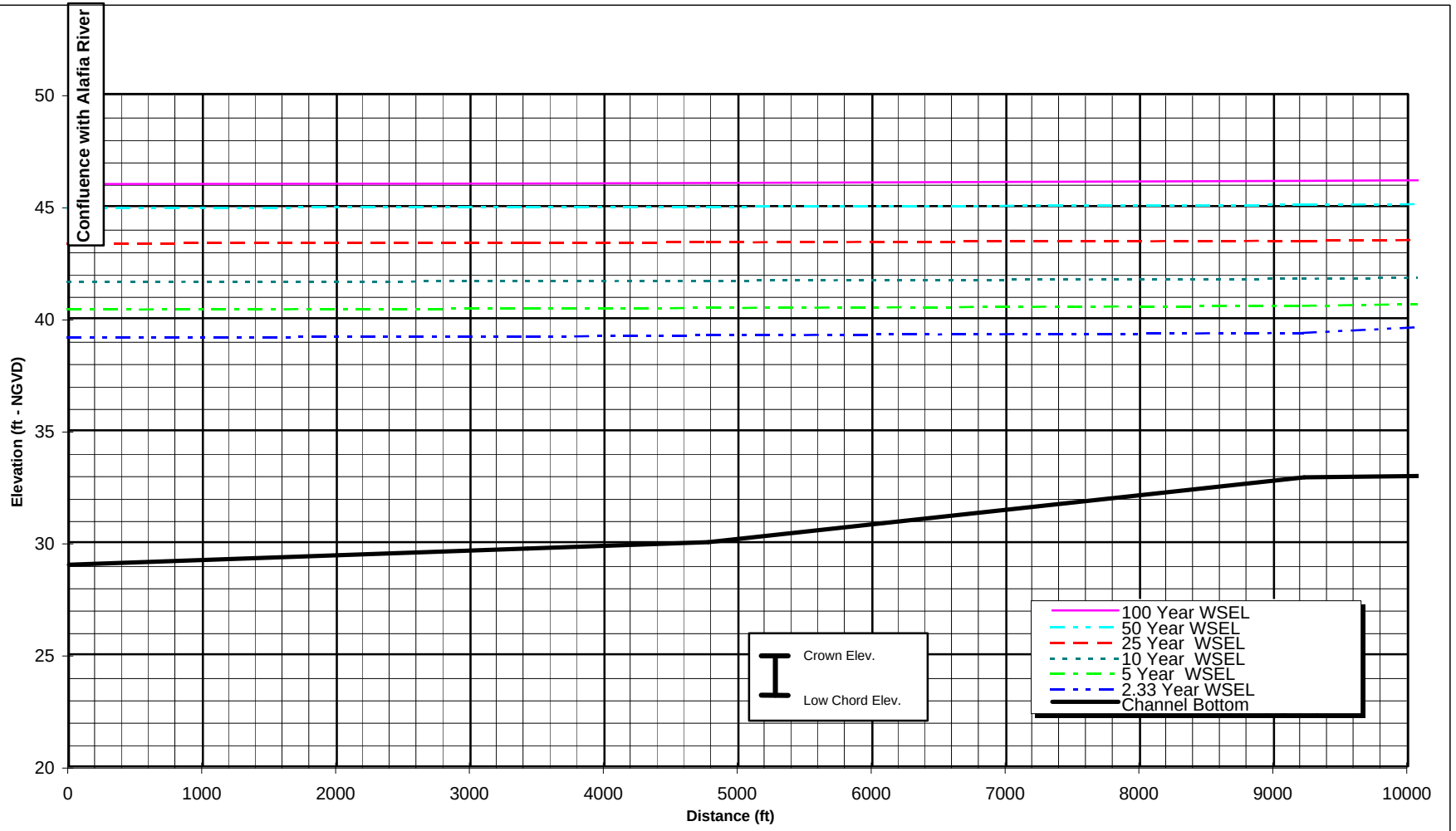
North Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-14
North Prong Alafia River \ Sloman Branch
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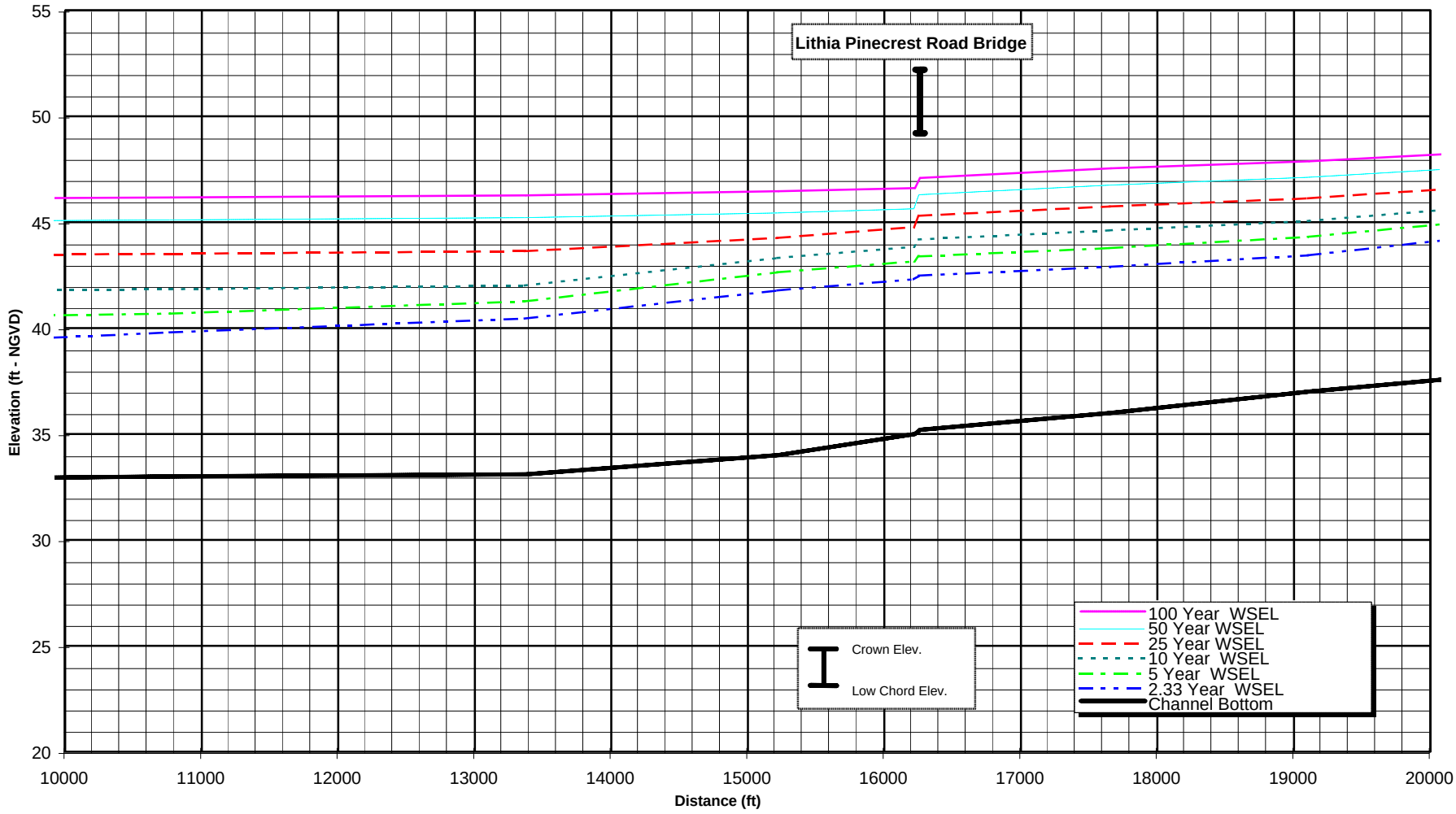
North Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-14
North Prong Alafia River \ Sloman Branch
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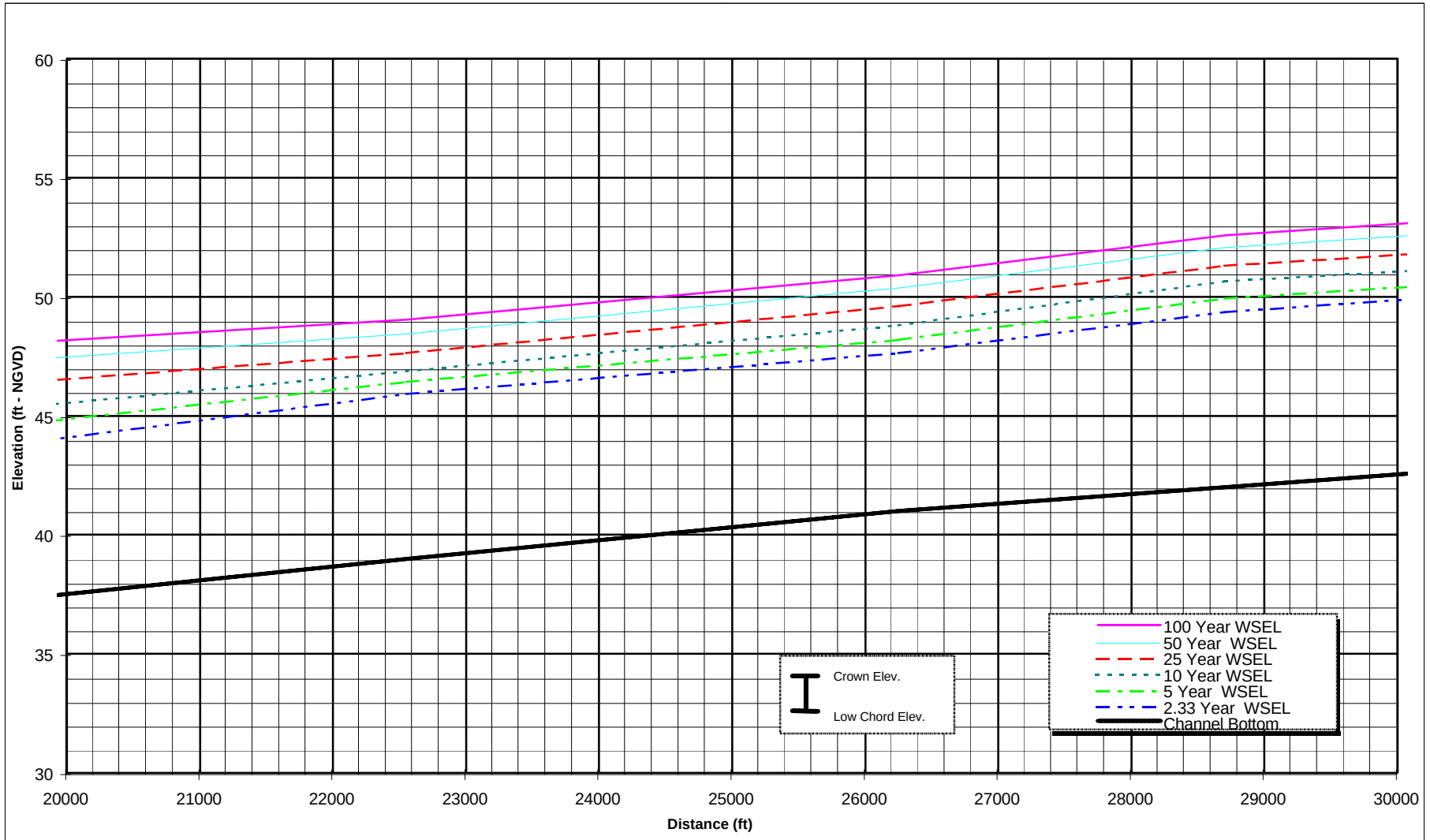
South Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-15
South Prong Alafia River \ Main Channel
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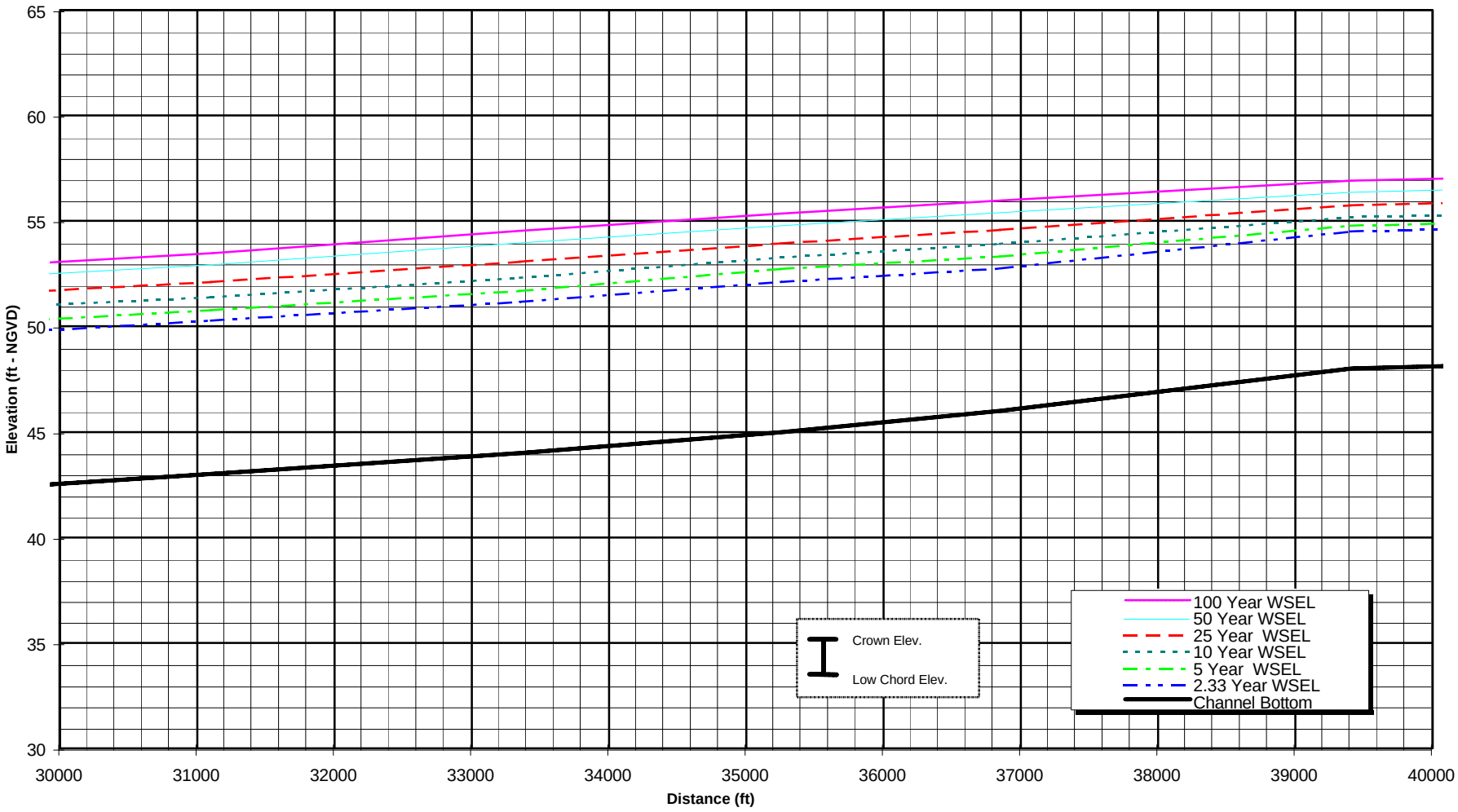
South Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-15
South Prong Alafia River \ Main Channel
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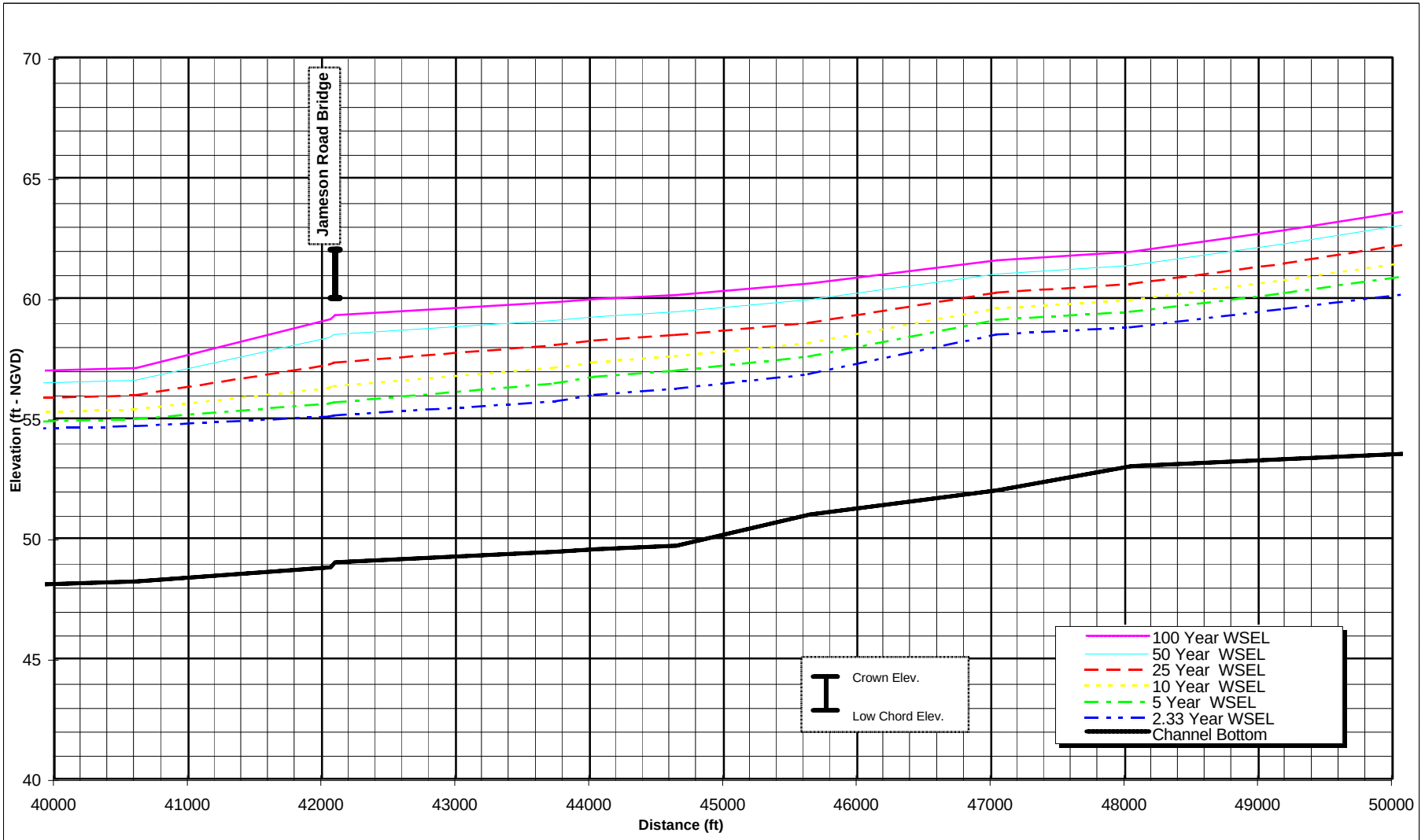
South Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-15
South Prong Alafia River \ Main Channel
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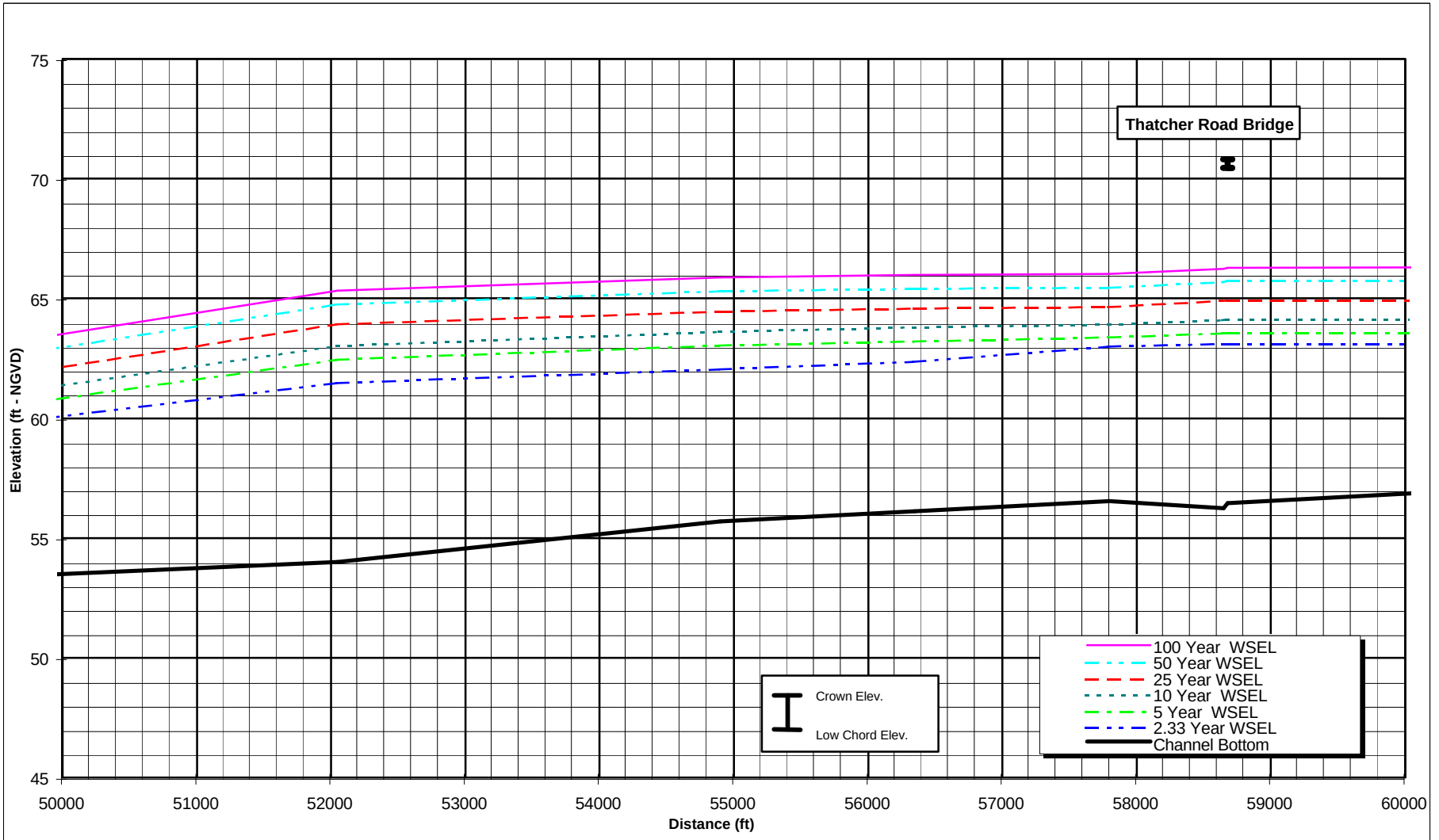
South Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-15
South Prong Alafia River \ Main Channel
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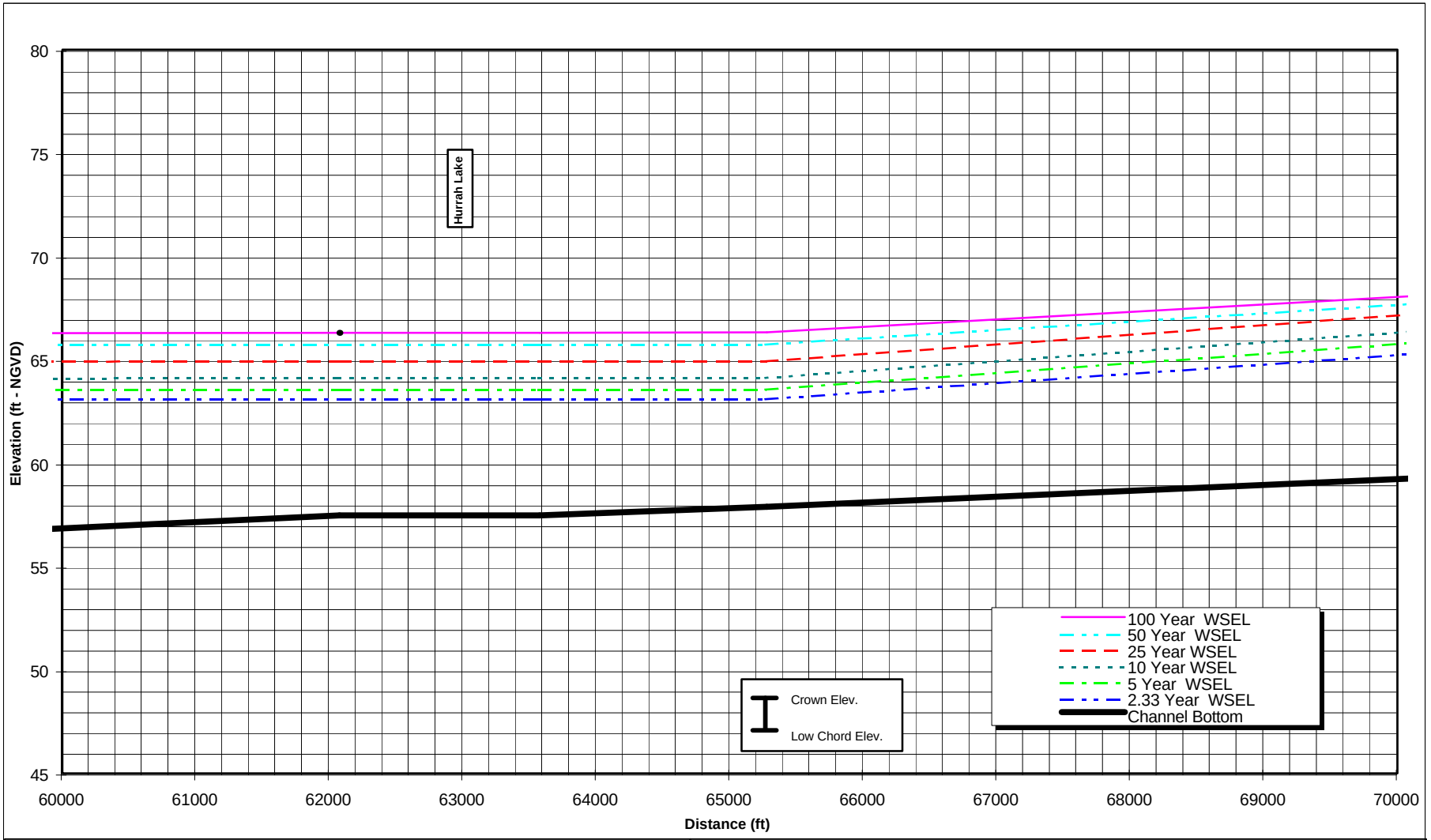
South Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-15
South Prong Alafia River \ Main Channel
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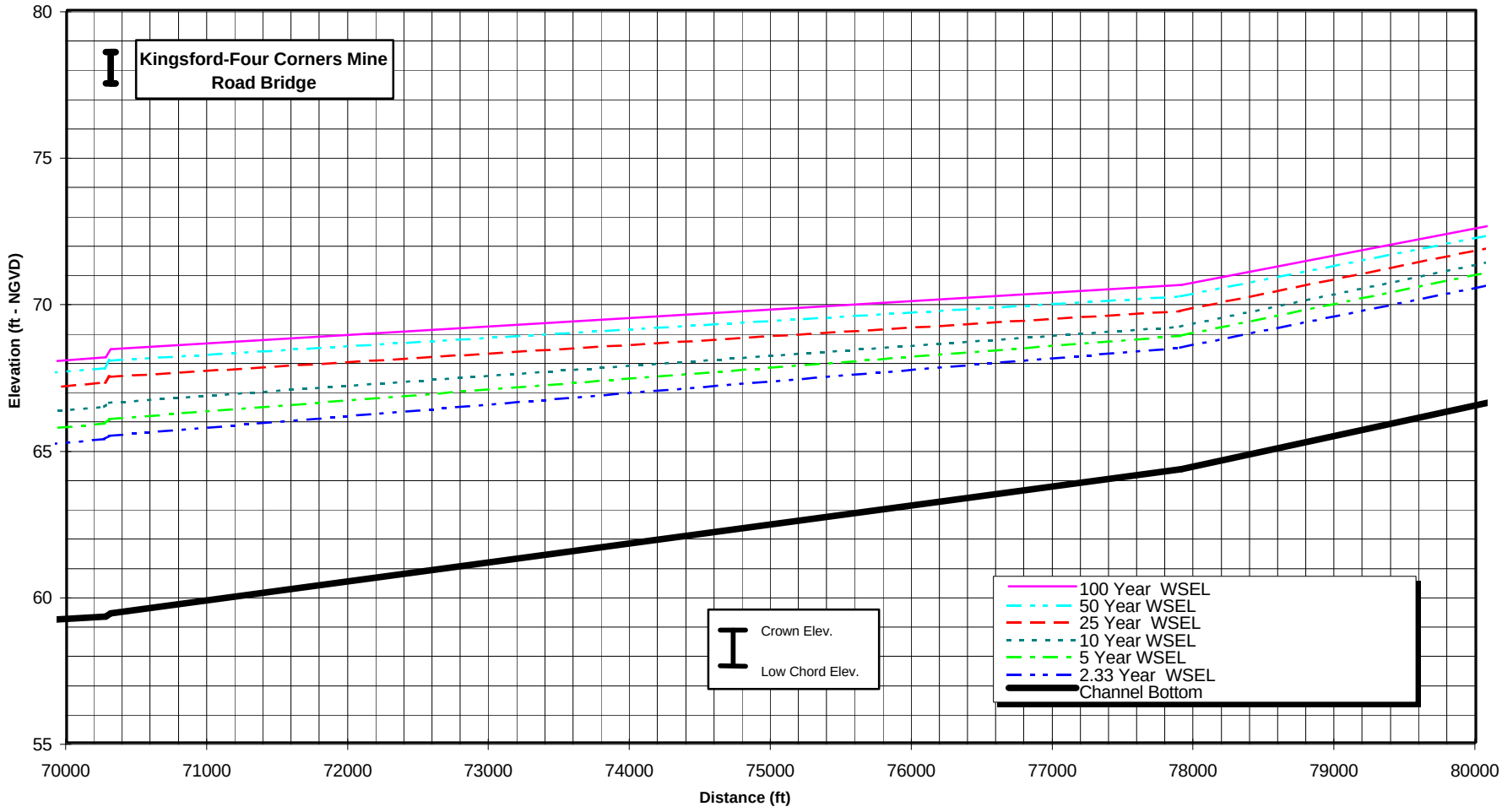
South Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-15
South Prong Alafia River \ Main Channel
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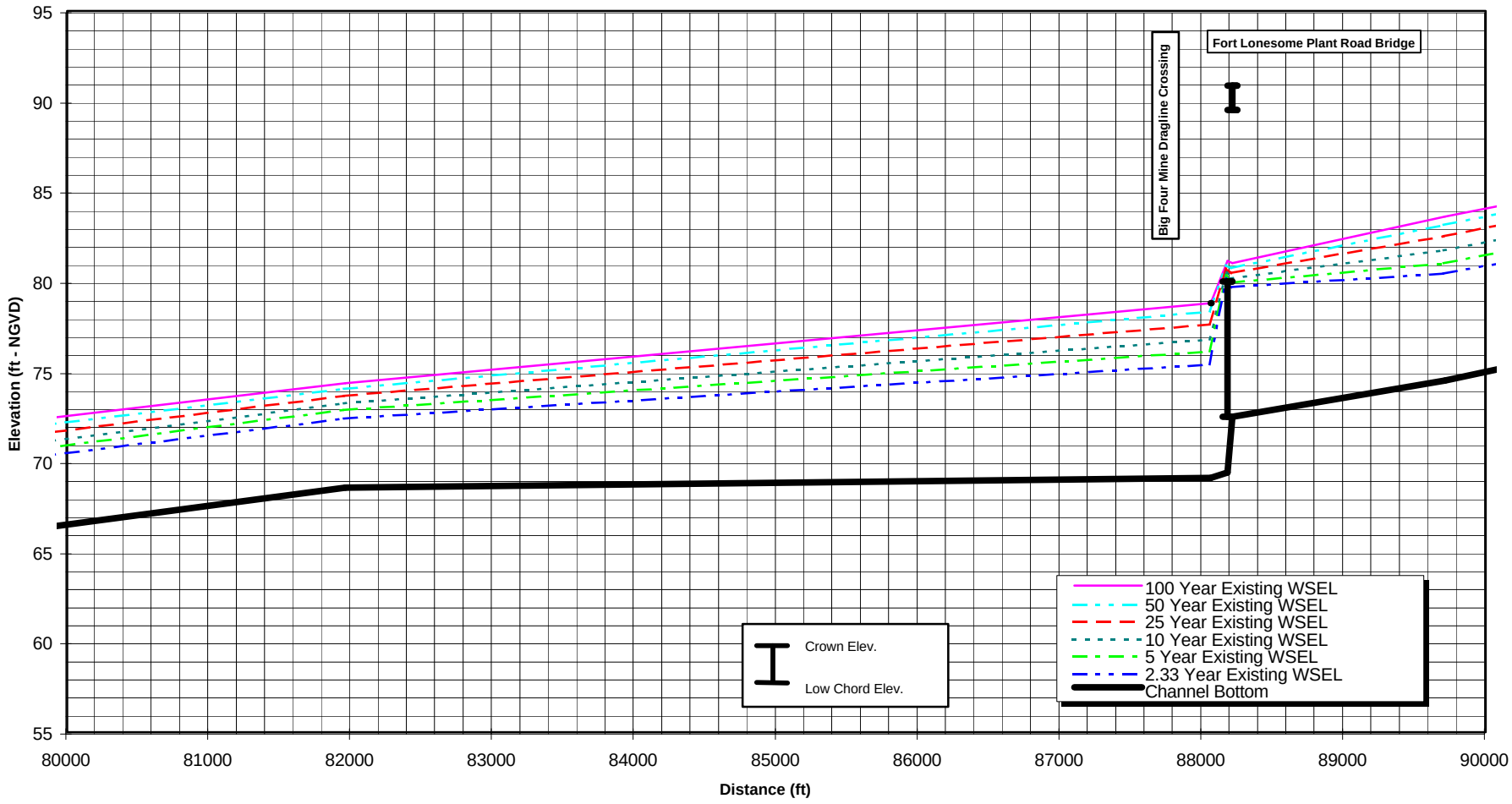
South Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-15
South Prong Alafia River \ Main Channel
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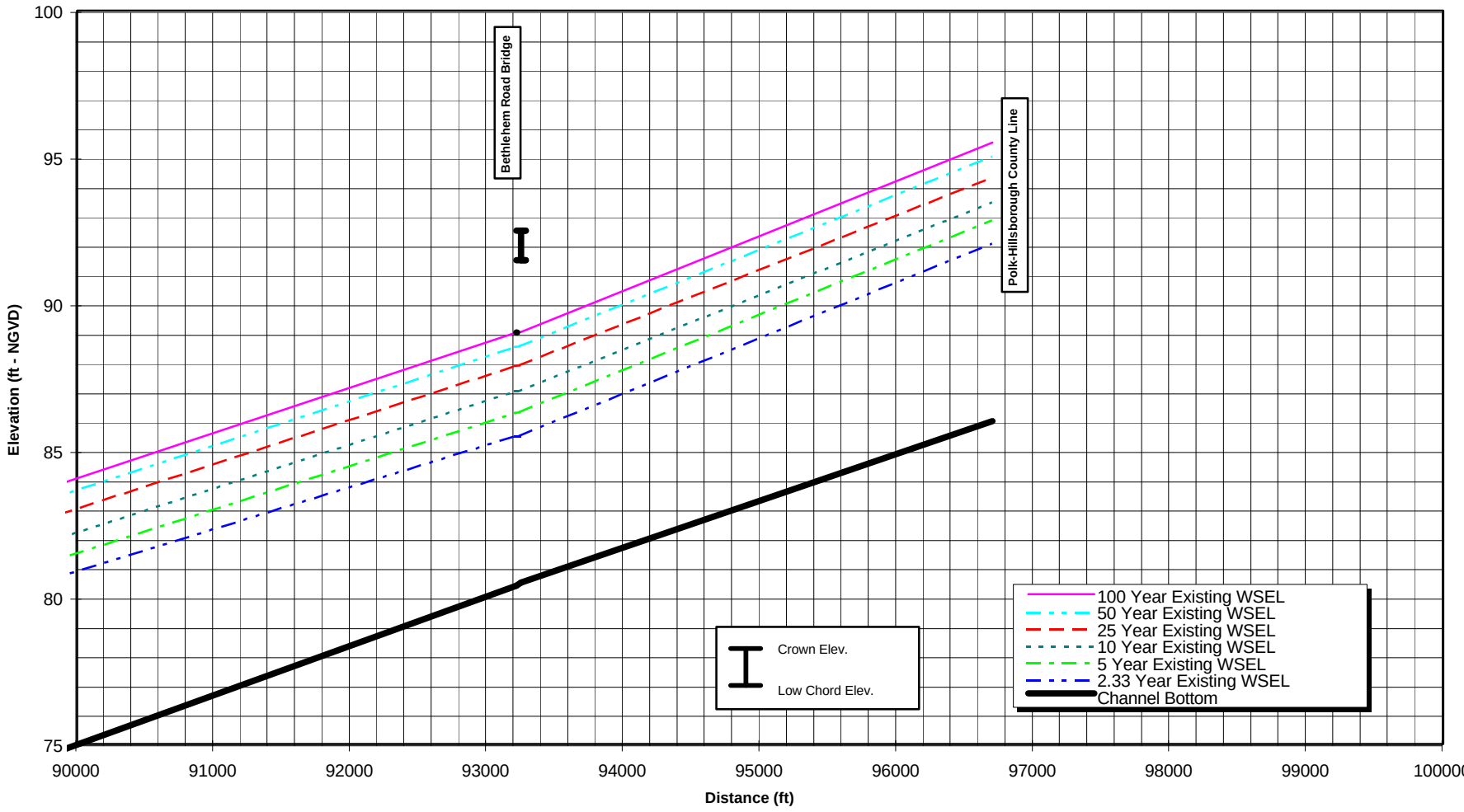
South Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-15
South Prong Alafia River \ Main Channel
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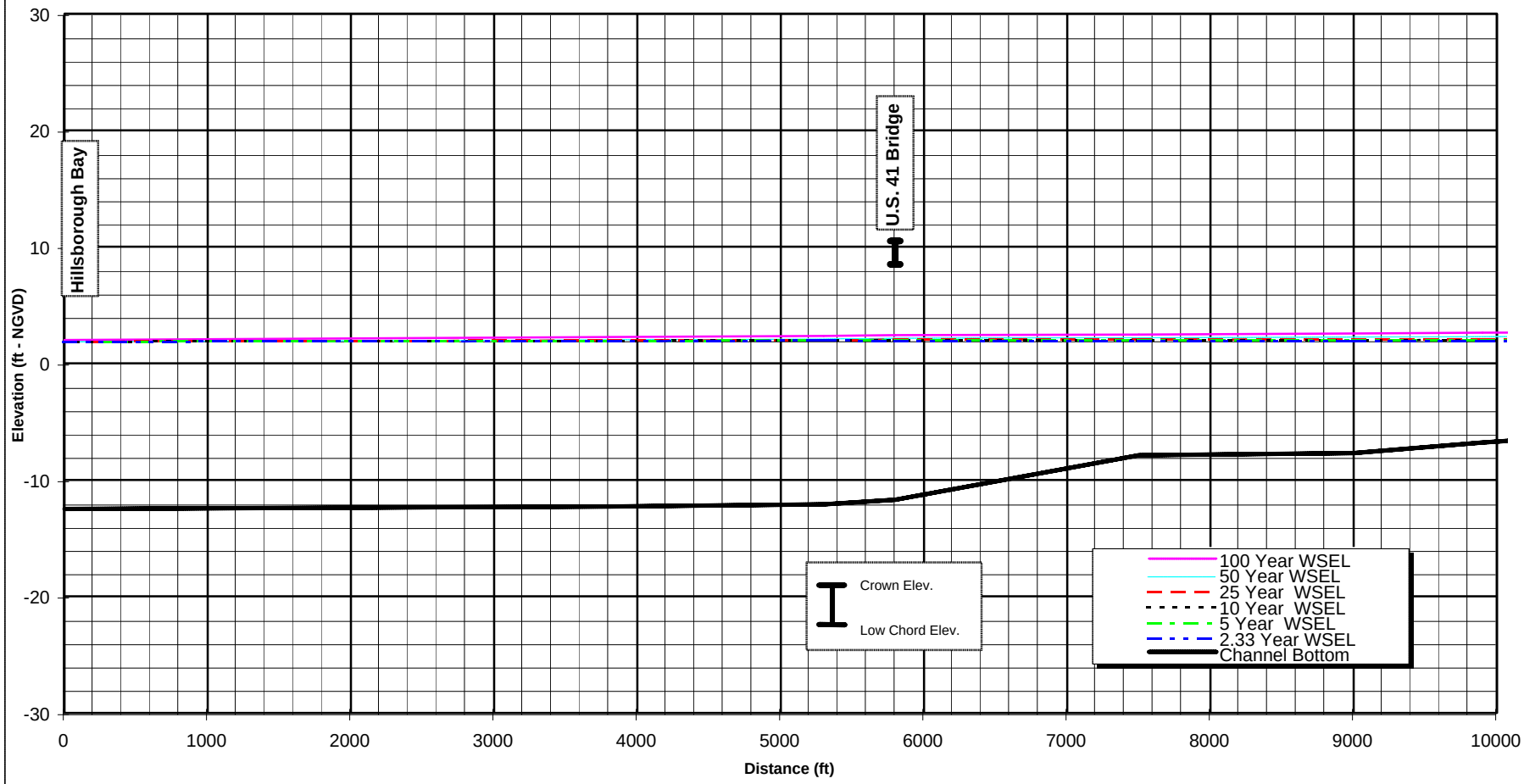
South Prong Alafia River Subwatershed
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January 2002

Figure 15.2-15
South Prong Alafia River \ Main Channel
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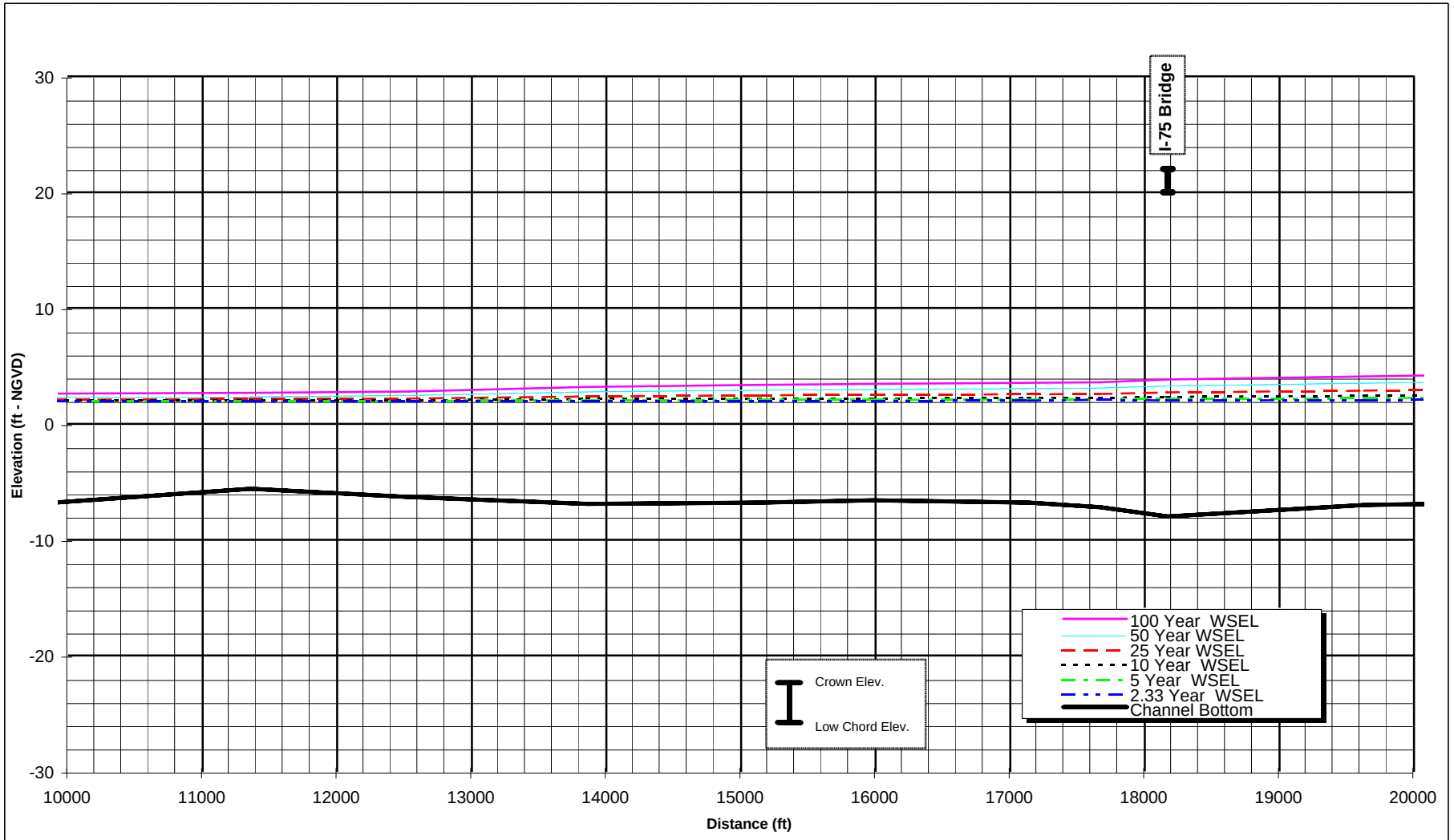
South Prong Alafia River Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-15
South Prong Alafia River \ Main Channel
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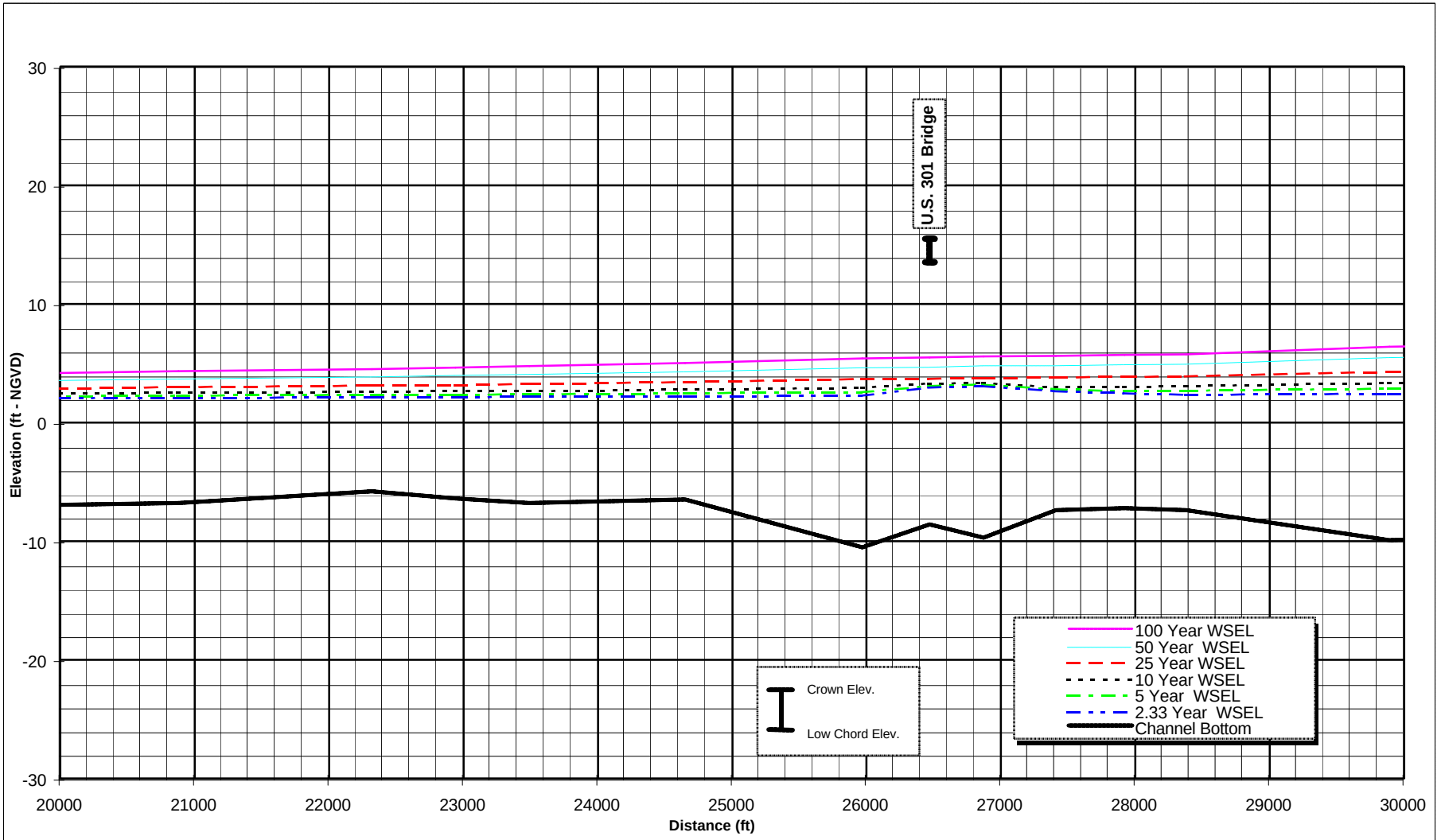
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River Main Channel
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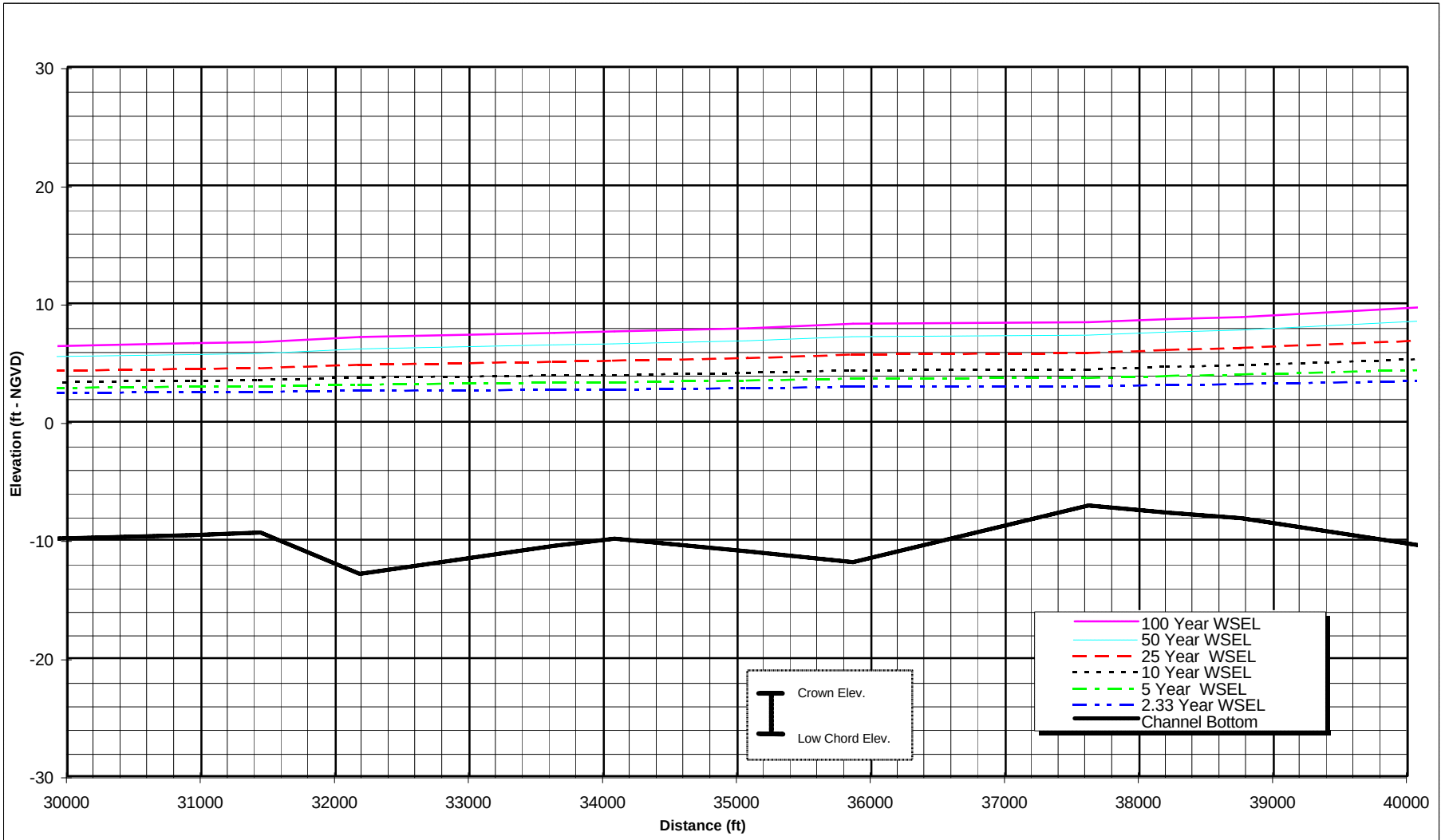
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River Main Channel
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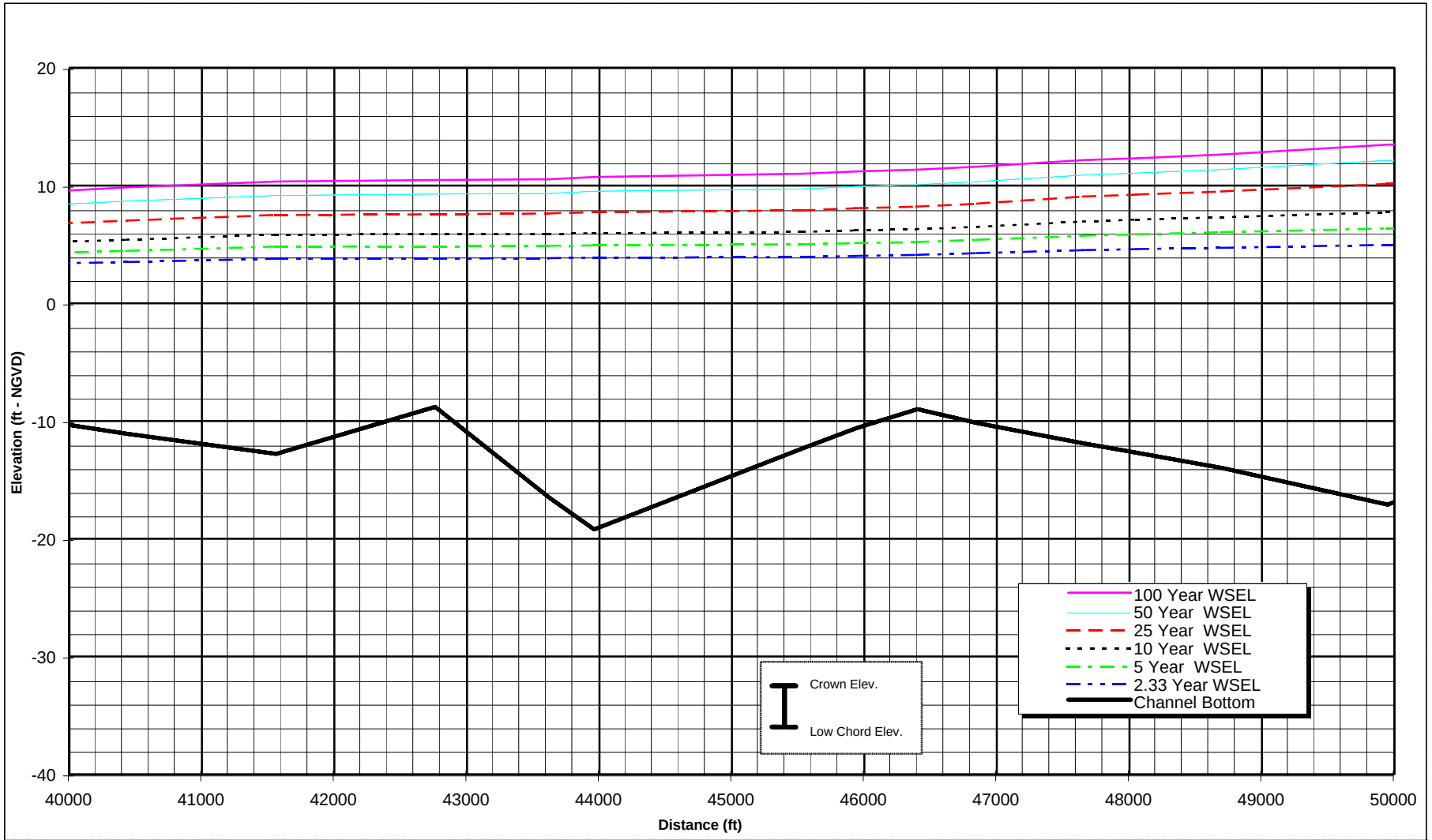
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River Main Channel
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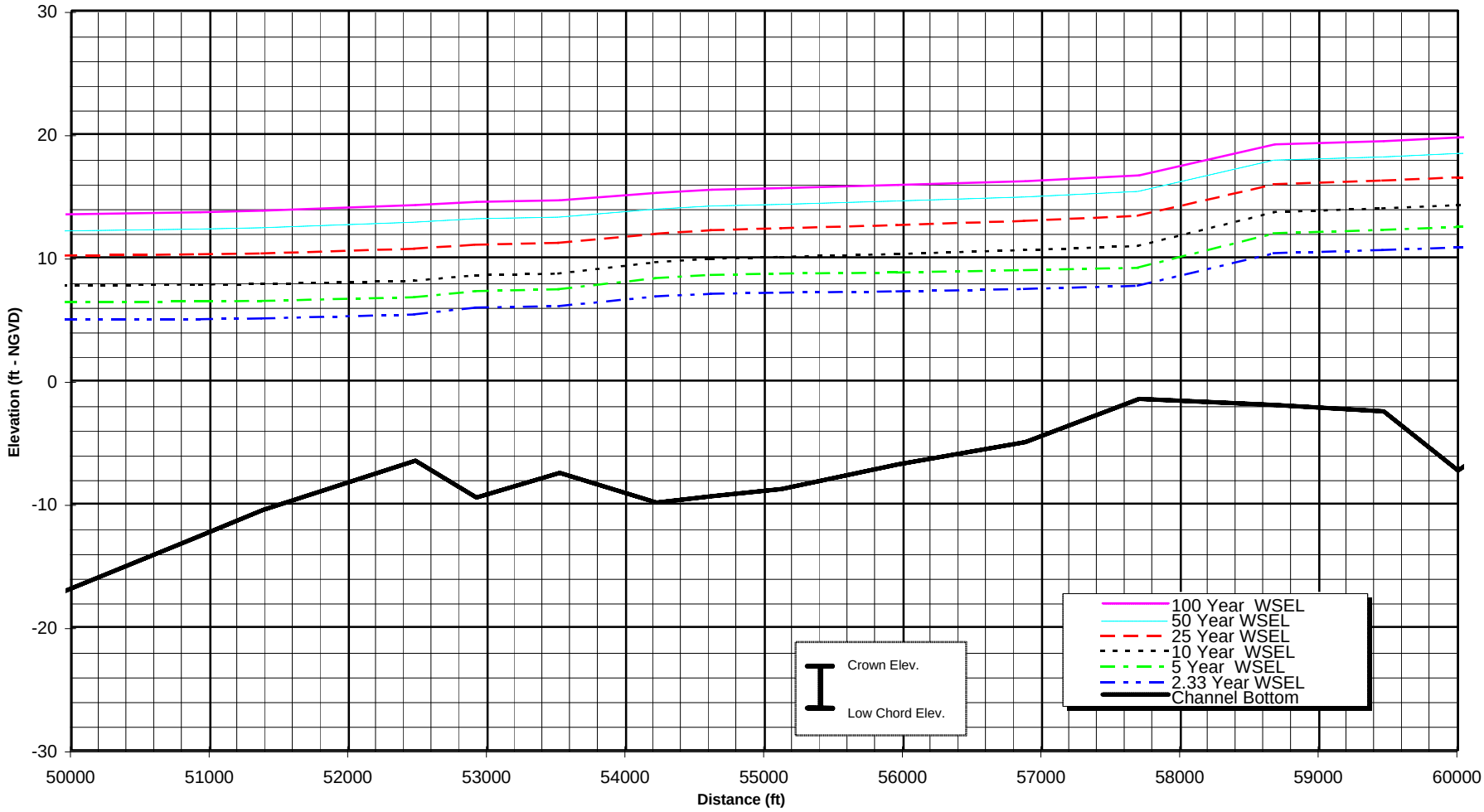
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-16
Alafia River Main Channel
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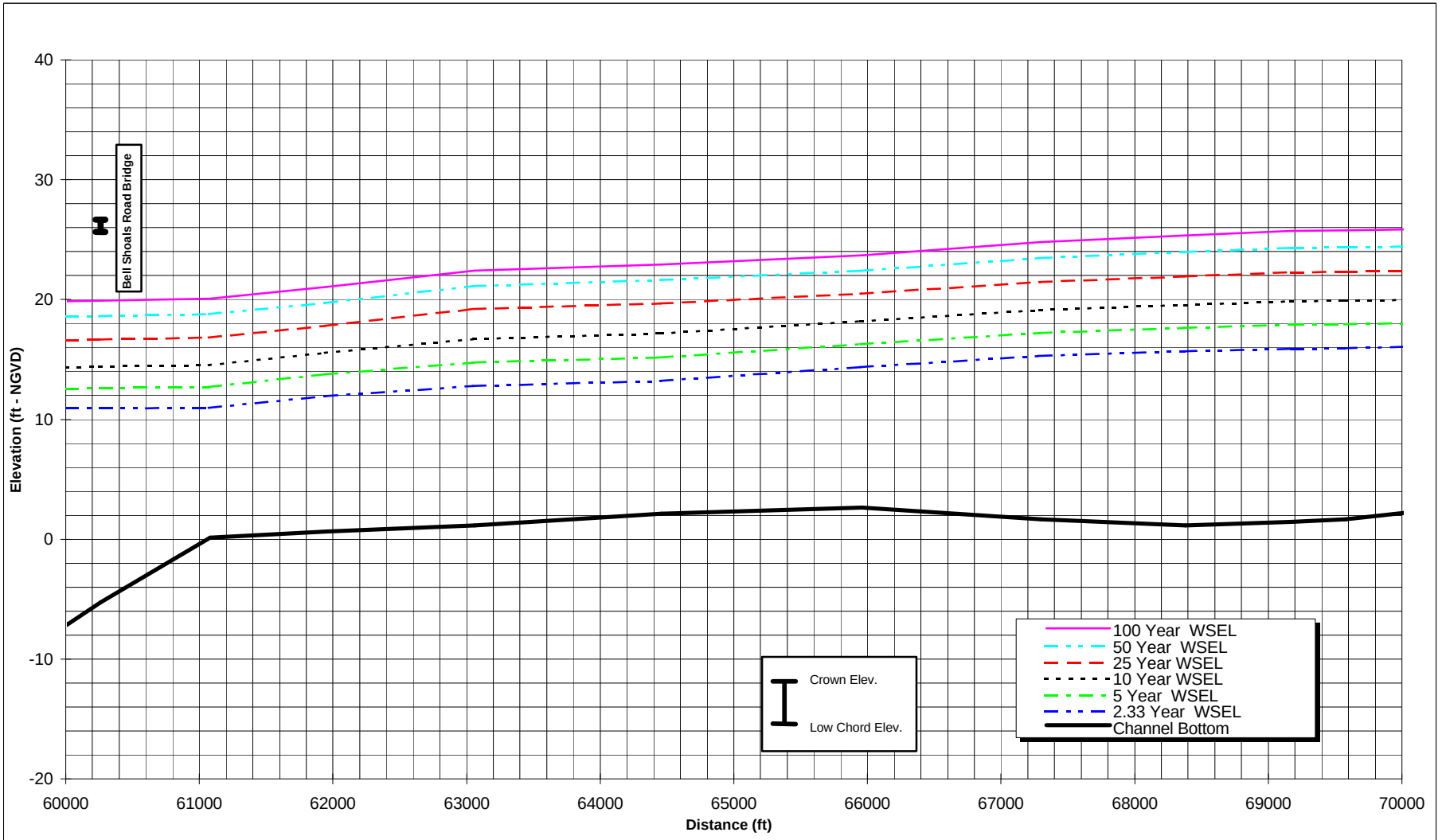
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-16
Alafia River Main Channel
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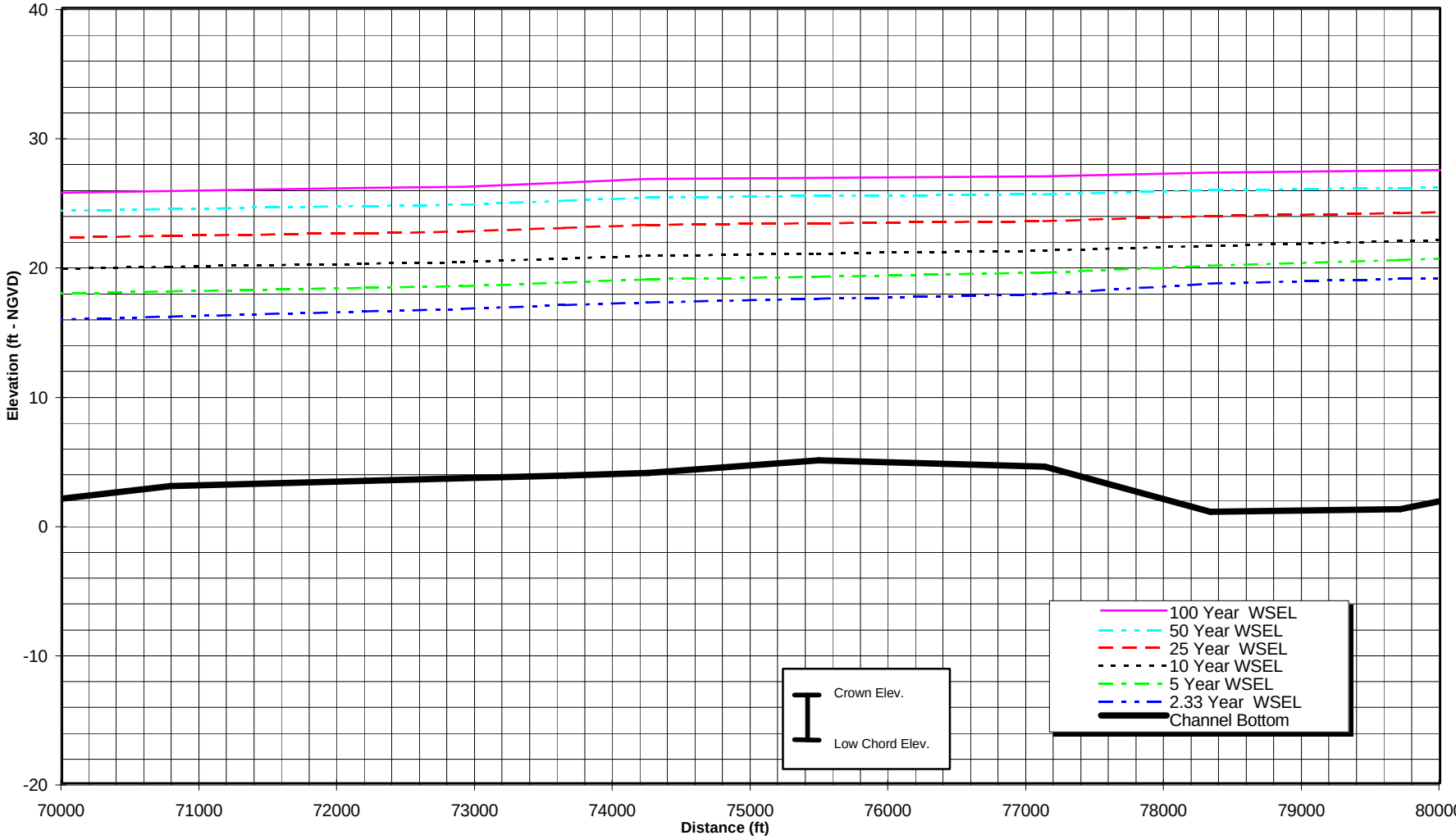
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-16
Alafia River Main Channel
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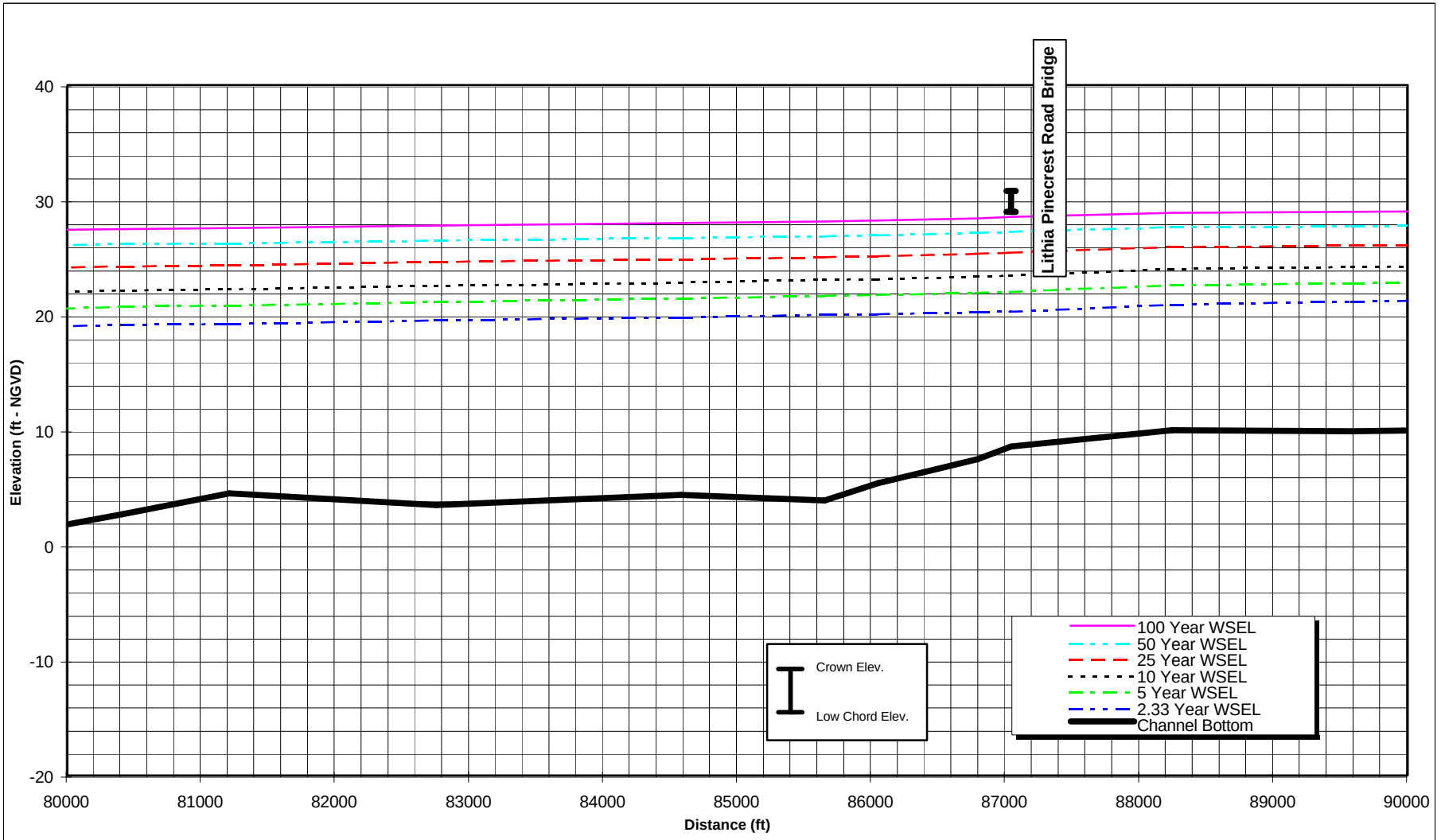
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River Main Channel
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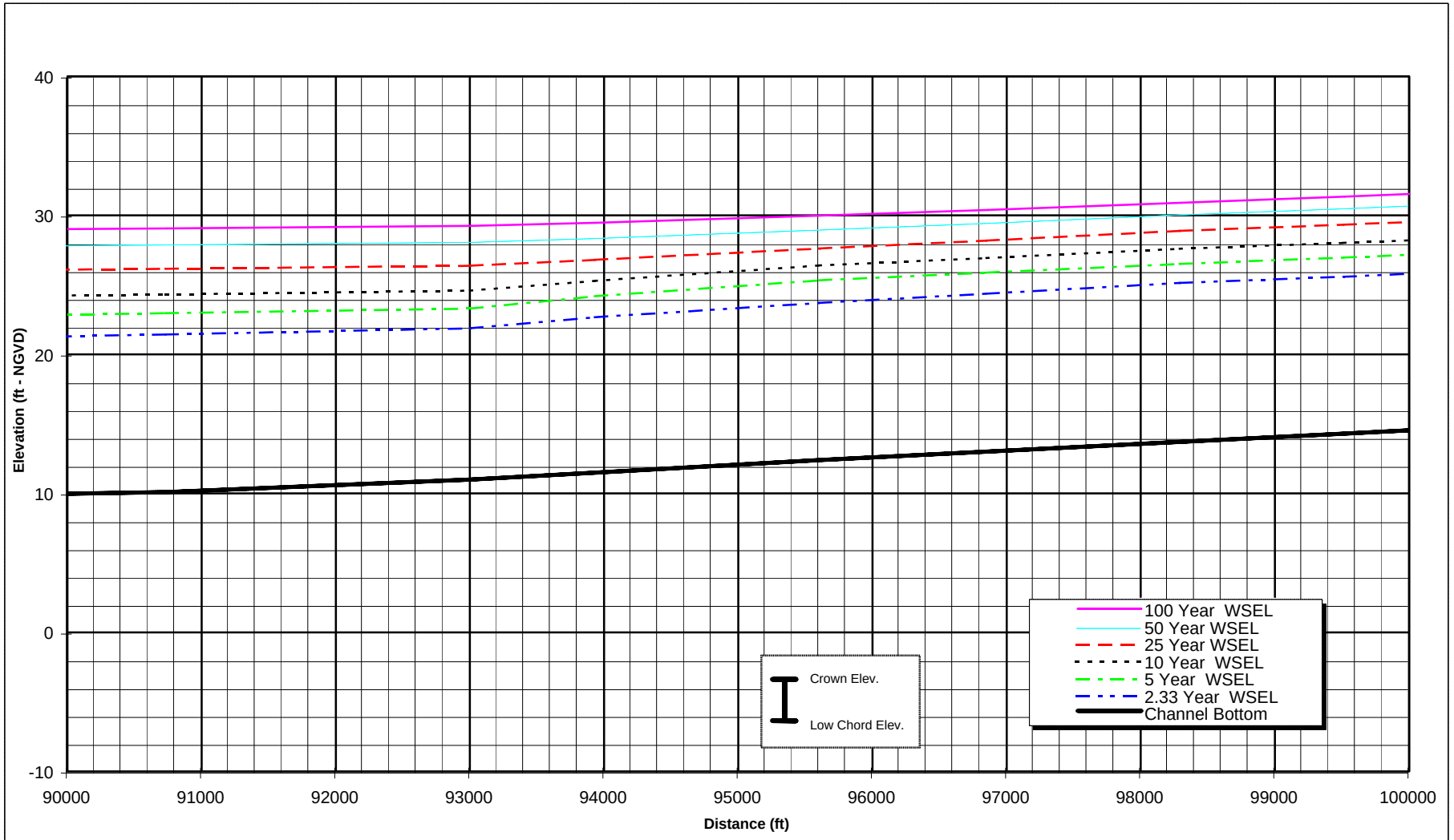
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure15.2-16
Alafia River Main Channel
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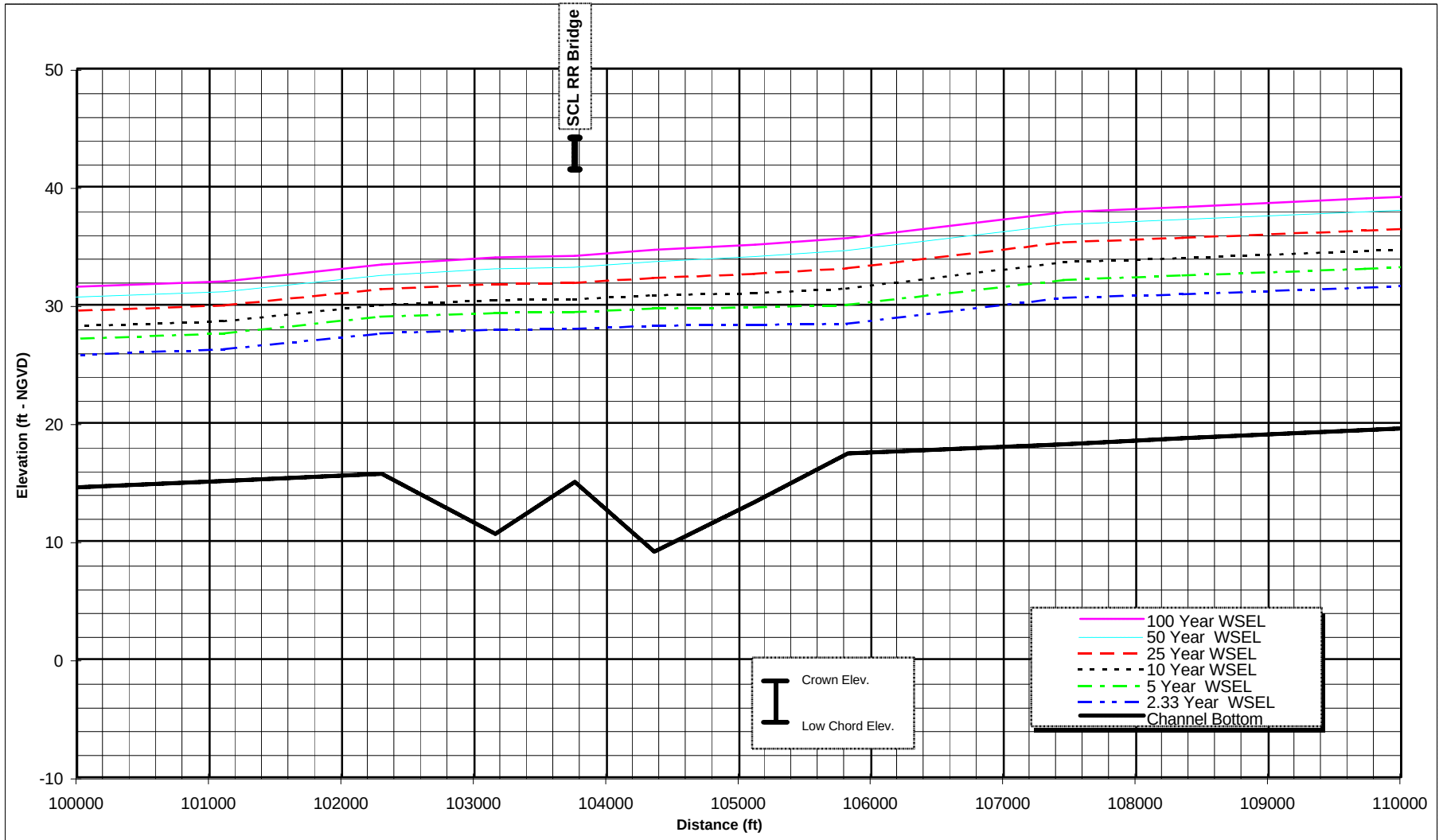
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-16
Alafia River Main Channel
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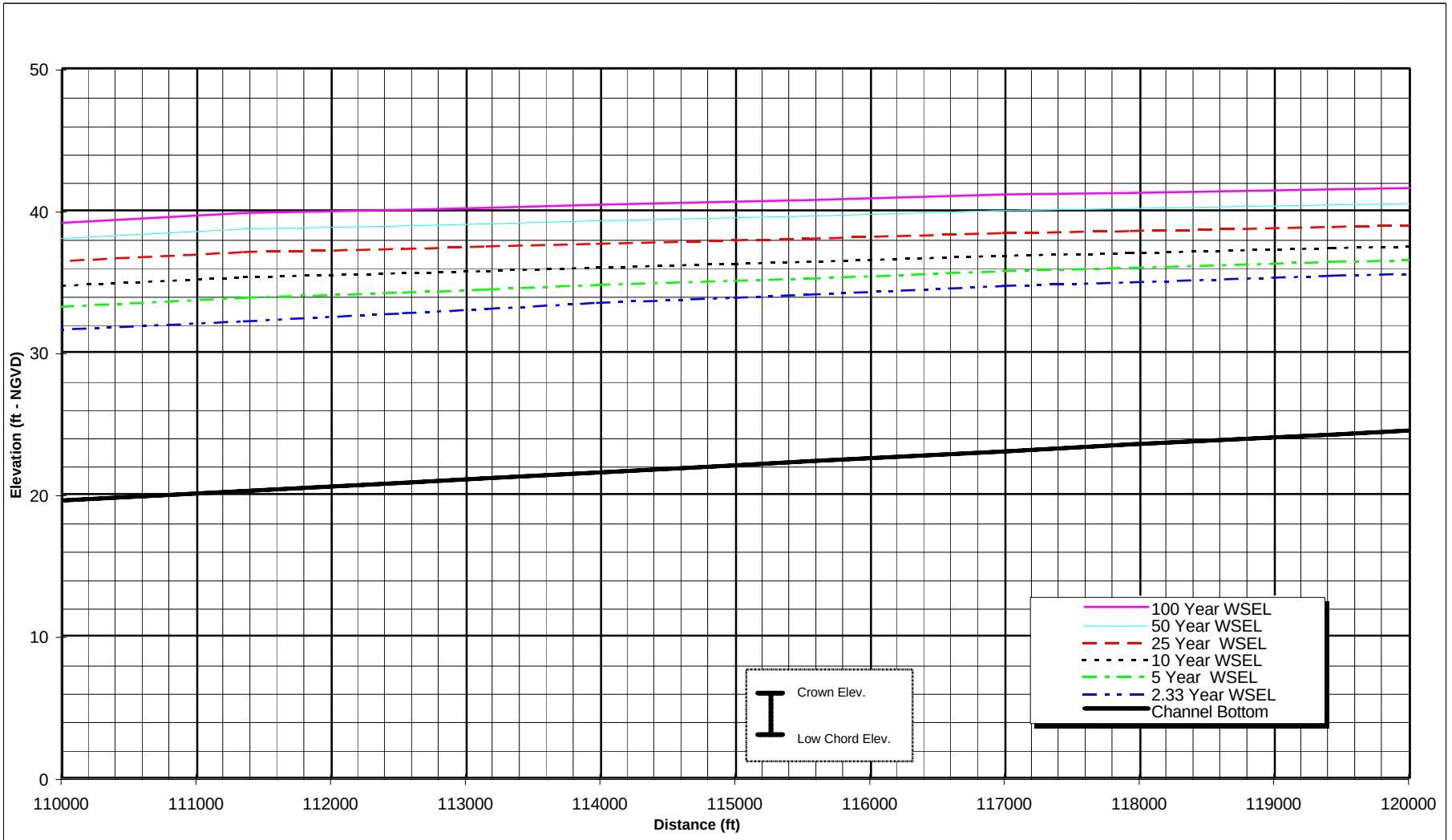
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
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Figure 15.2-16
Alafia River Main Channel
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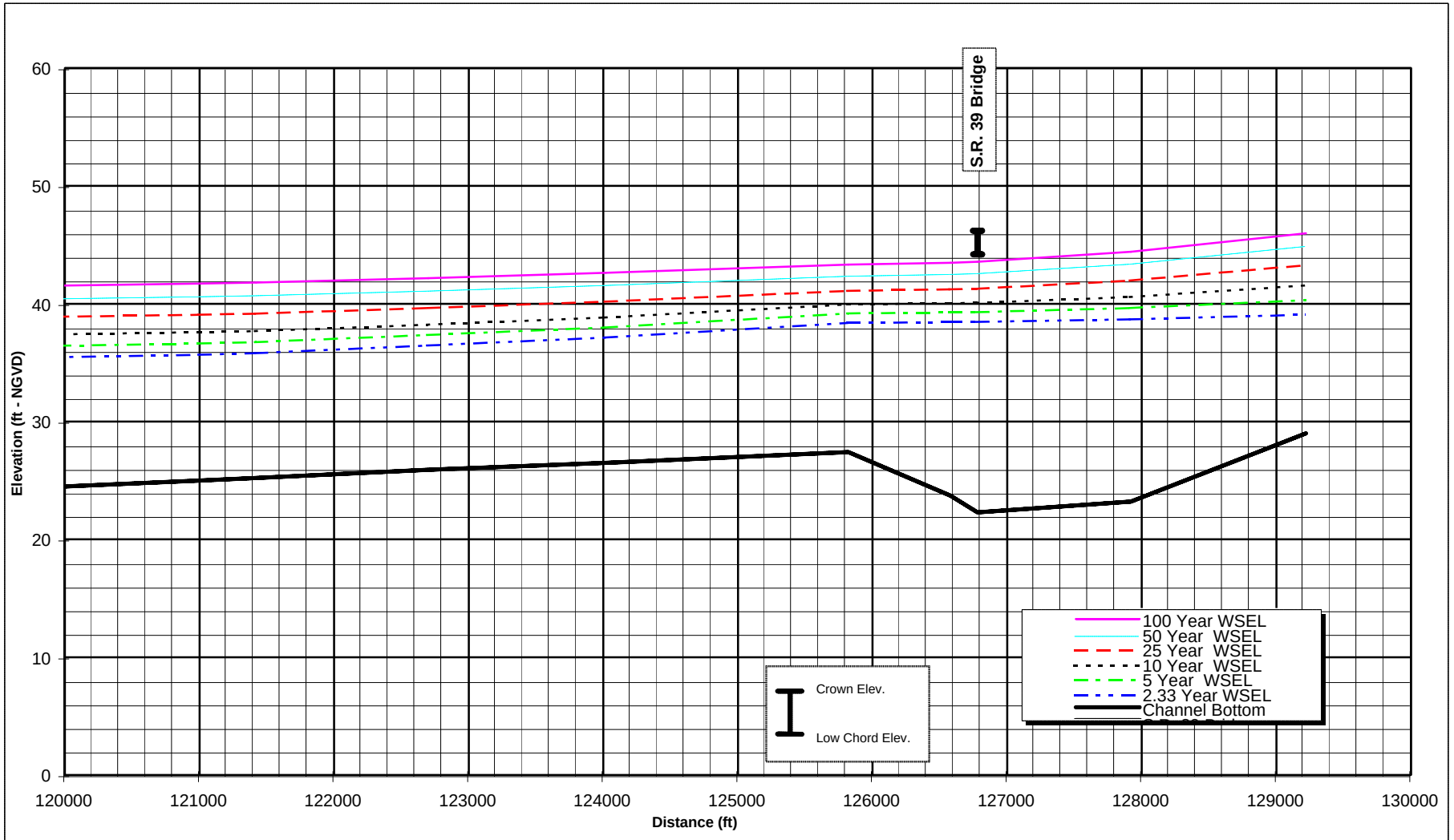
Alafia River Main Stem Subwatershed
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Figure 15.2-16
Alafia River Main Channel
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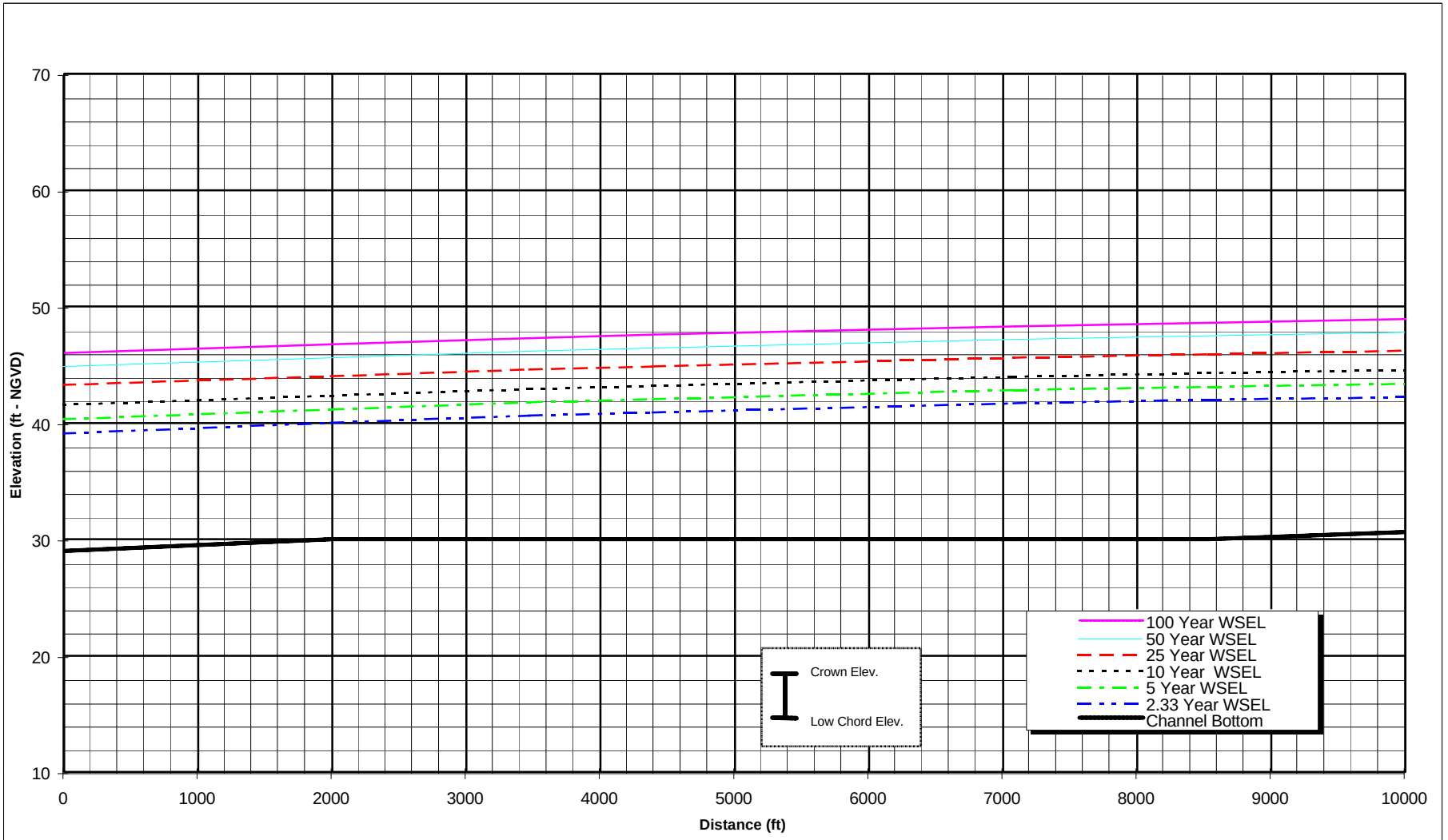
Alafia River Main Stem Subwatershed
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Figure 15.2-16
Alafia River Main Channel
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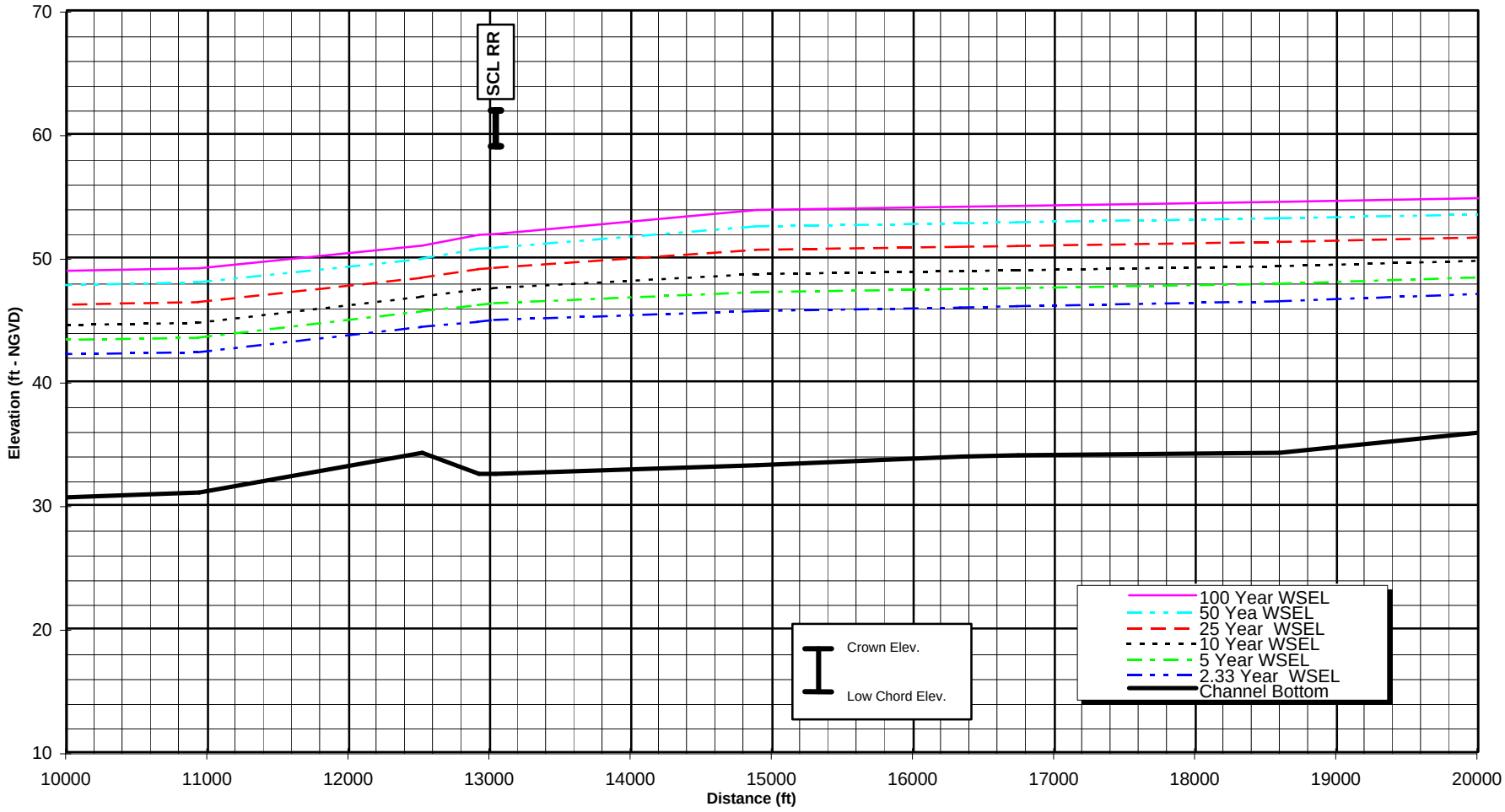
Alafia River Main Stem Subwatershed
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Figure 15.2-16
Alafia River Main Channel
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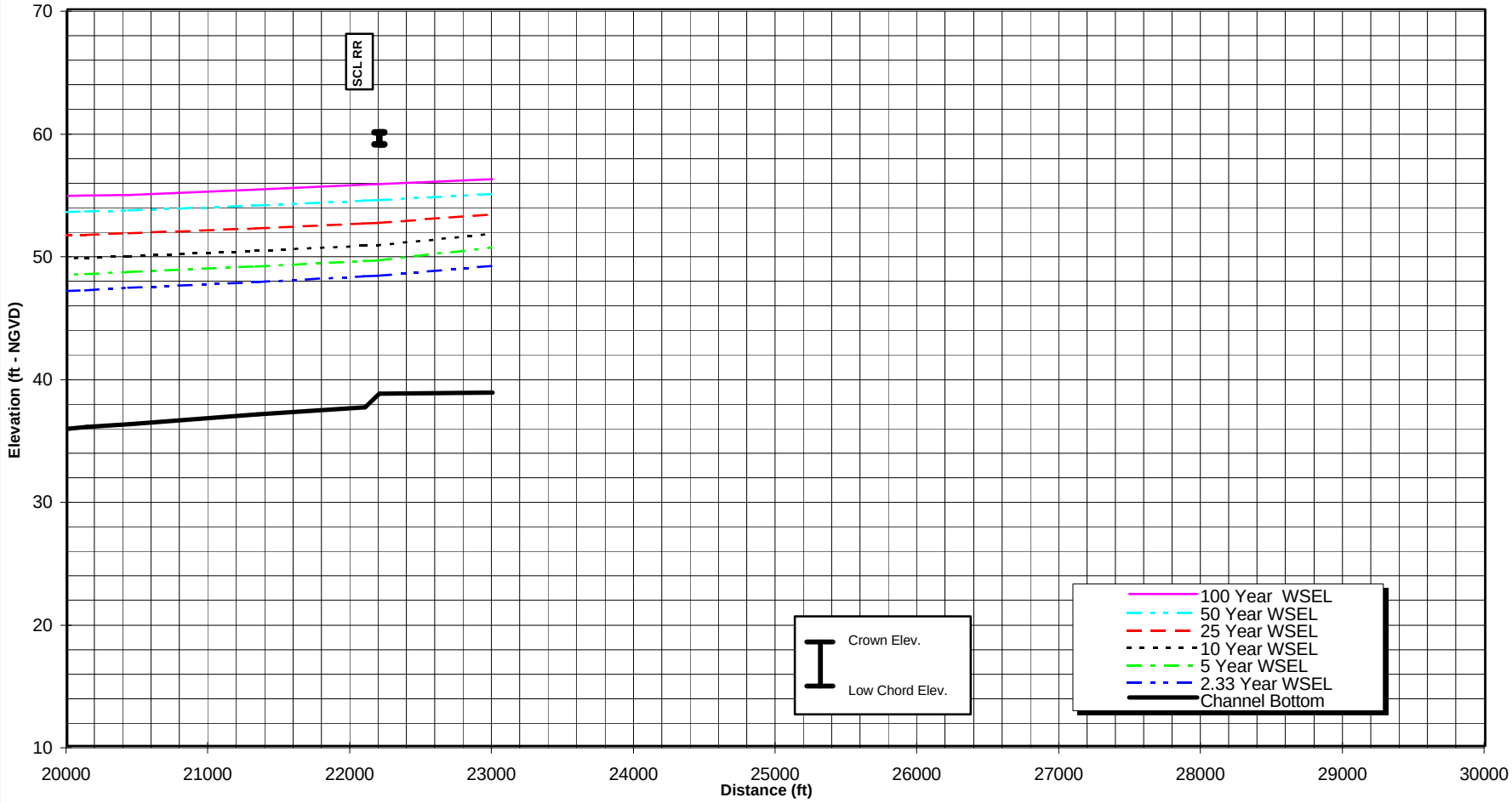
Alafia River Main Stem Subwatershed
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Figure 15.2-16
Lower North Prong Alafia River
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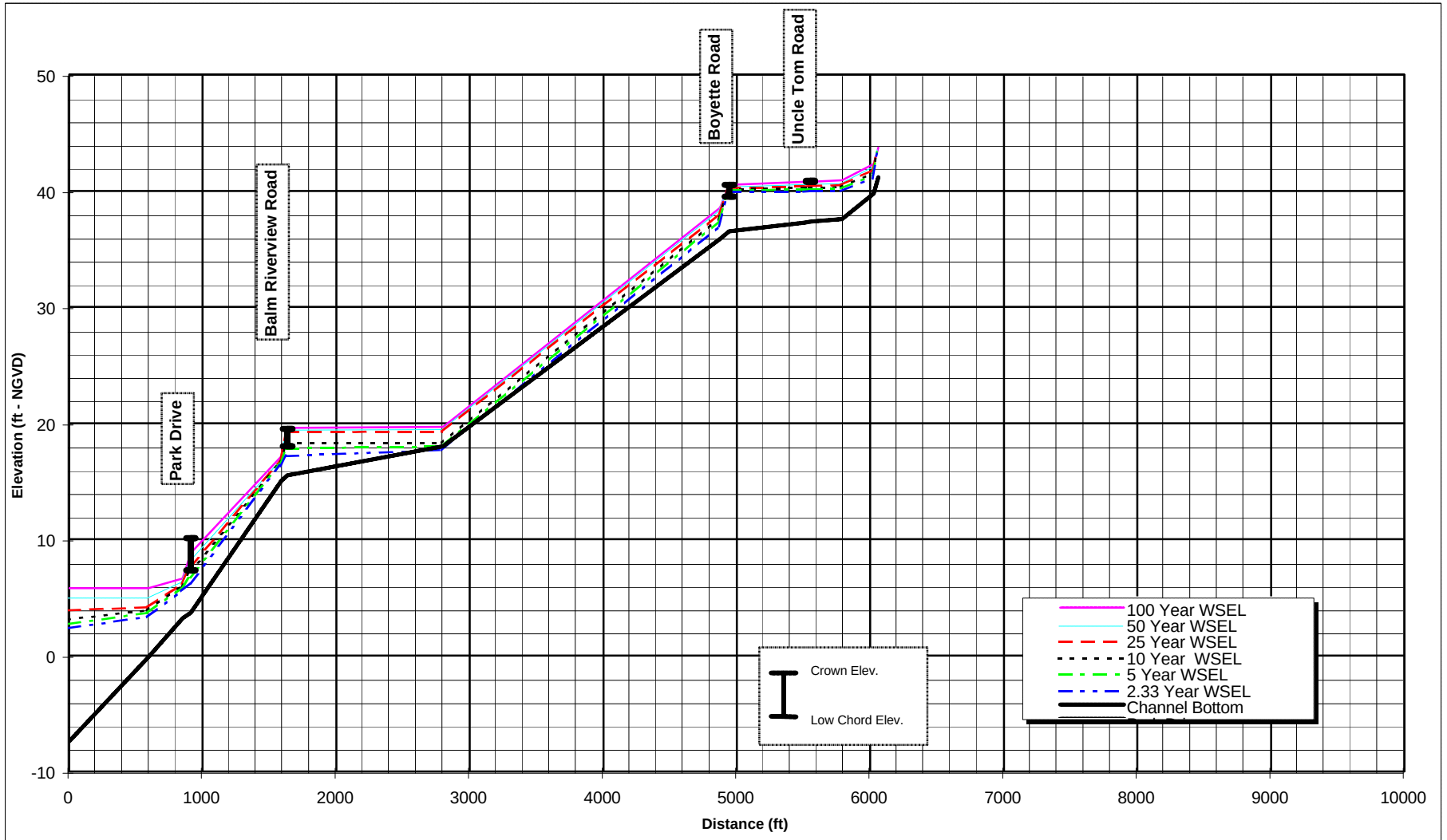
Alafia River Main Stem Subwatershed
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Figure 15.2-16
Lower North Prong Alafia River
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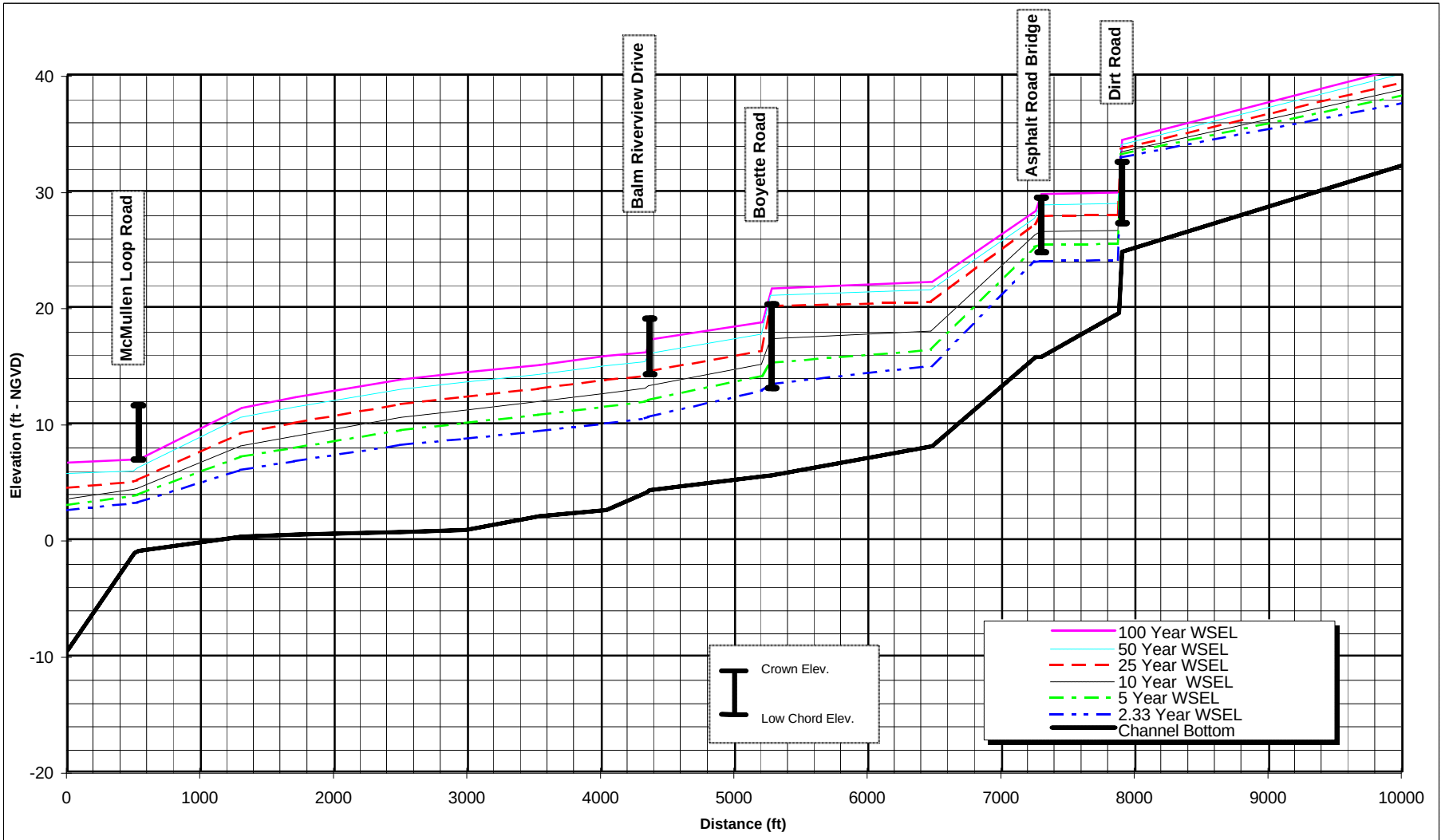
Alafia River Main Stem Subwatershed
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Figure 15.2-16
Lower North Prong Alafia River
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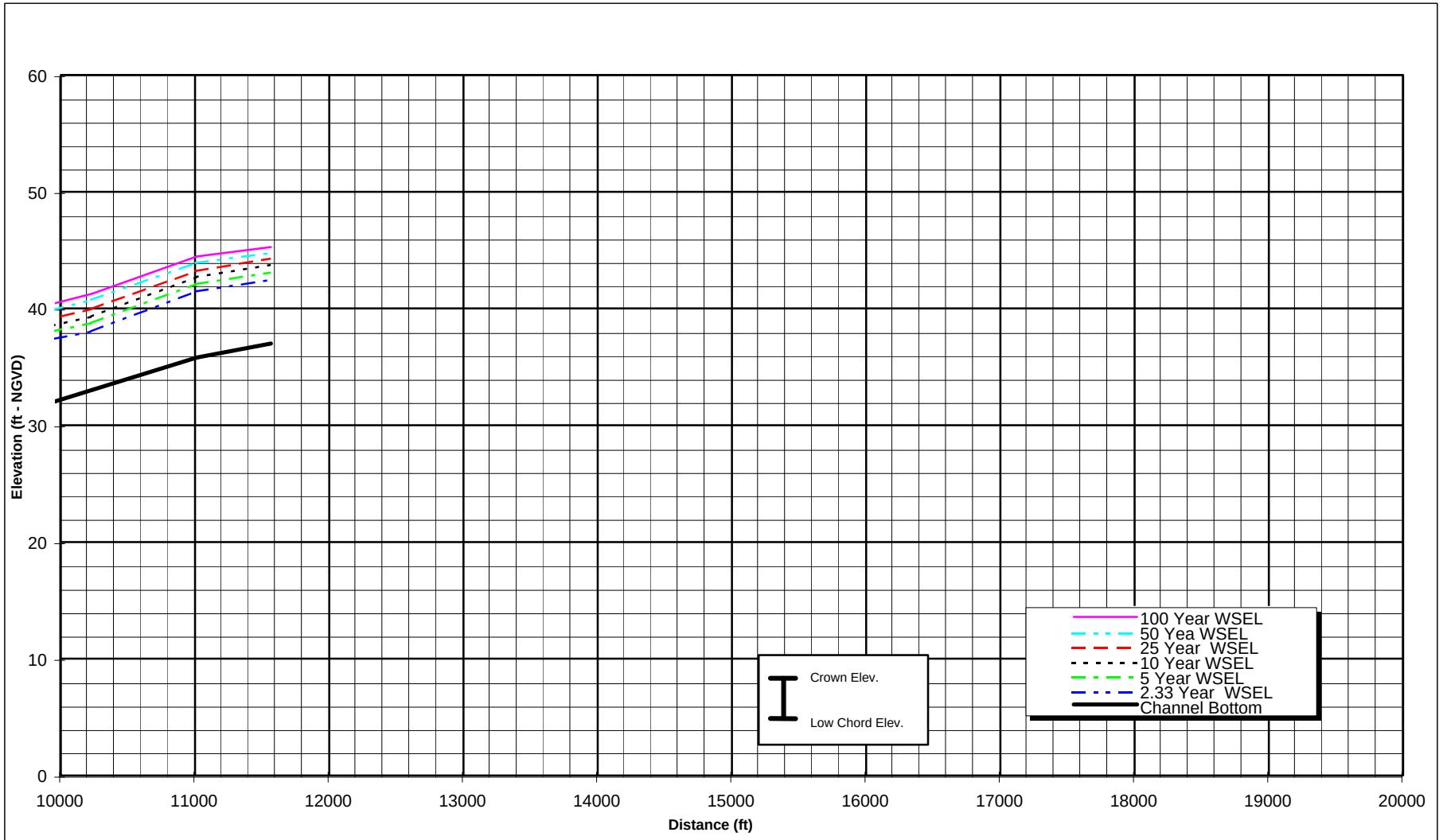
Alafia River Main Stem Subwatershed
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Figure 15.2-16
Alafia River / Tributary S-5
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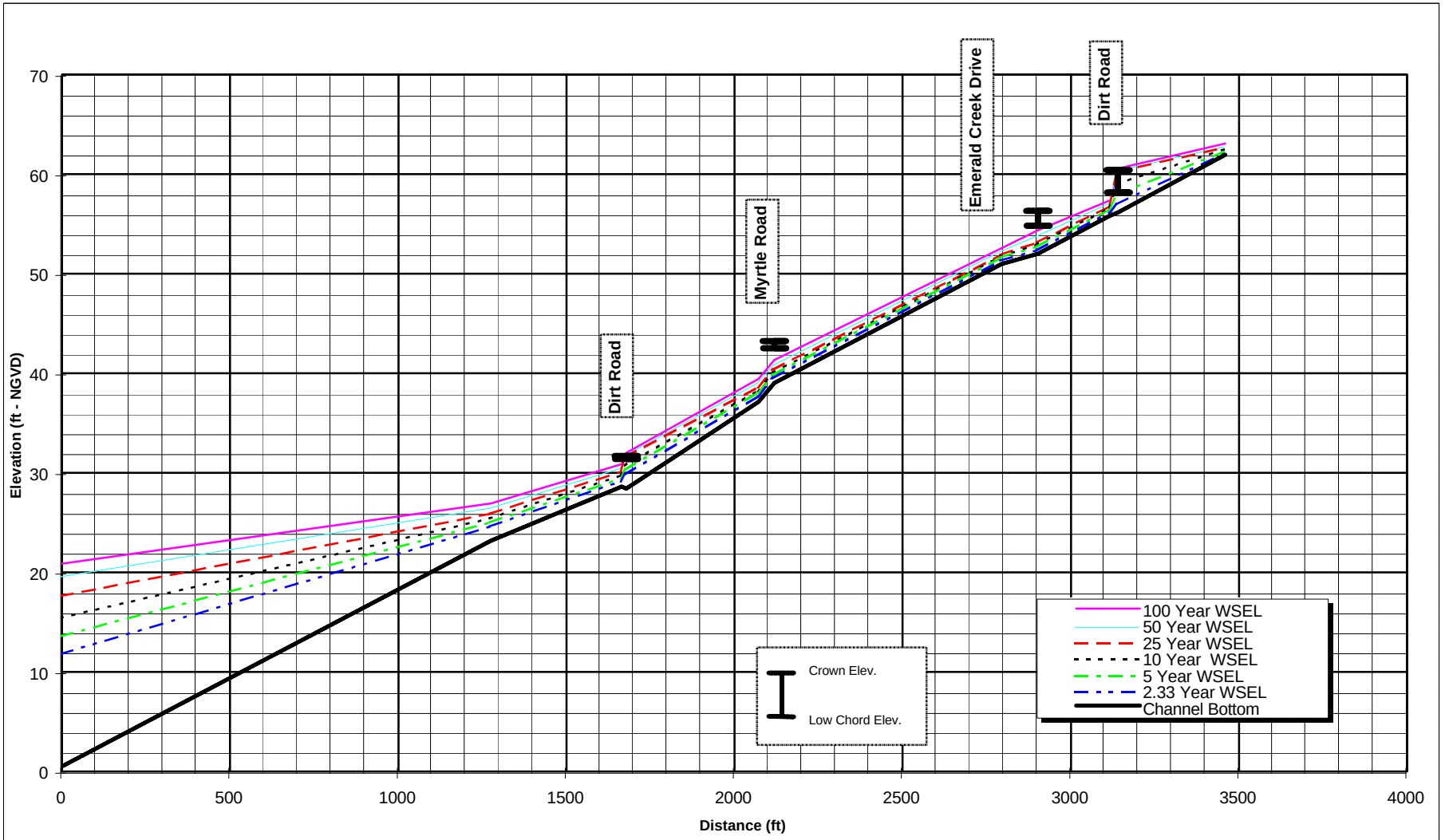
Alafia River Main Stem Subwatershed
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Figure 15.2-16
Alafia River / Rice Creek
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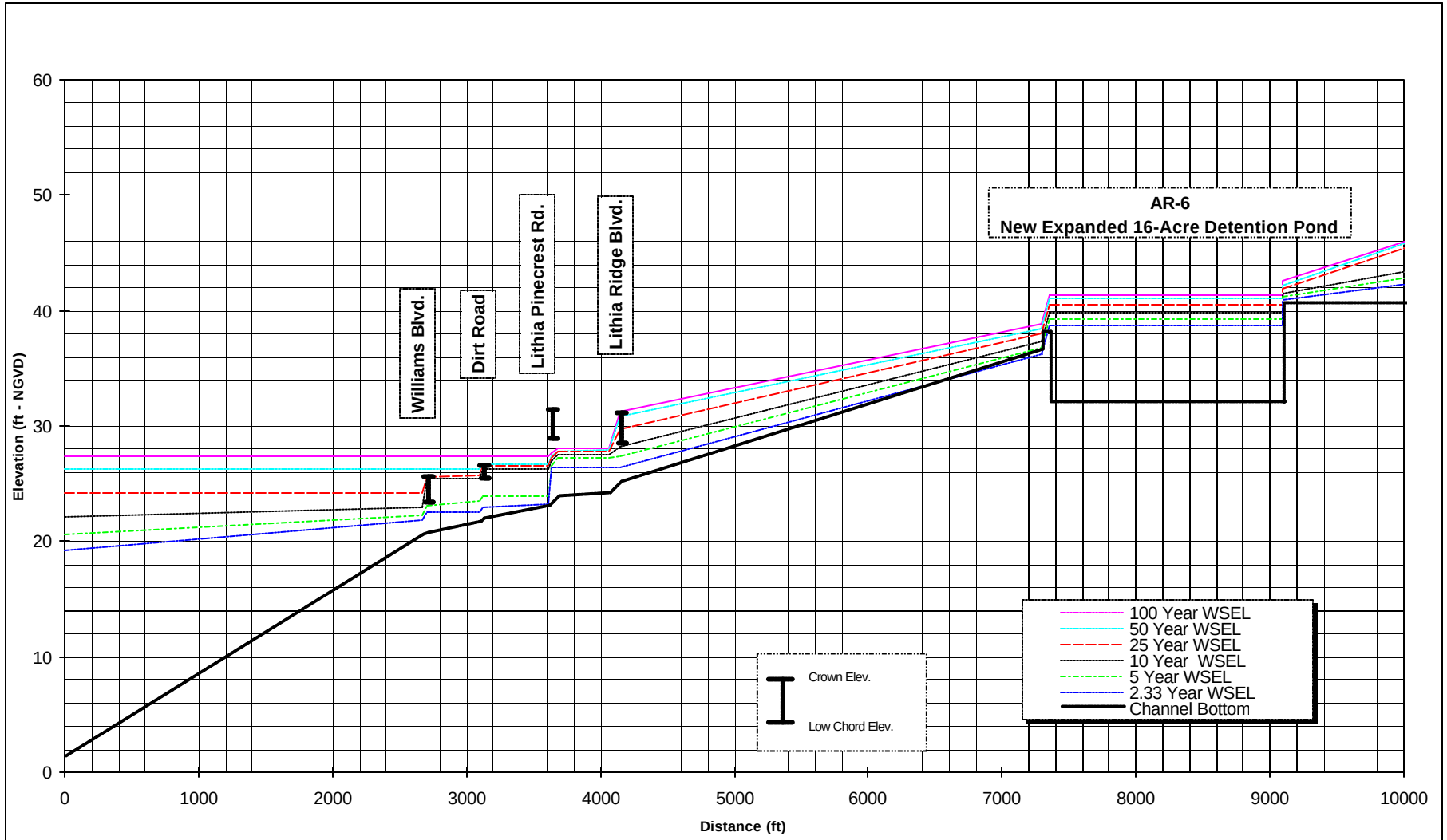
Alafia River Main Stem Subwatershed
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Figure 15.2-16
Alafia River / Rice Creek
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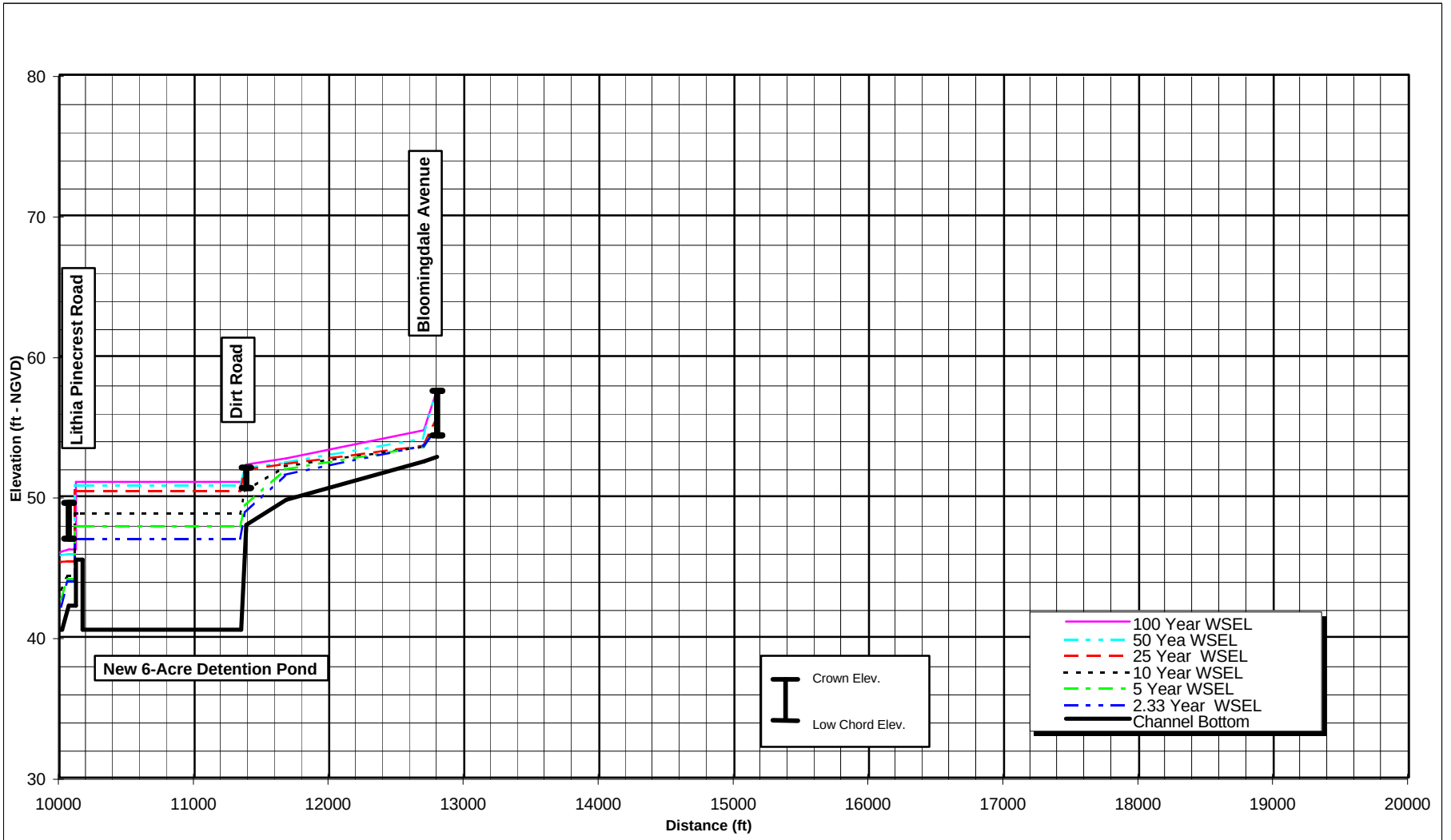
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River / Tributary N-12
Sheet 20 of 25



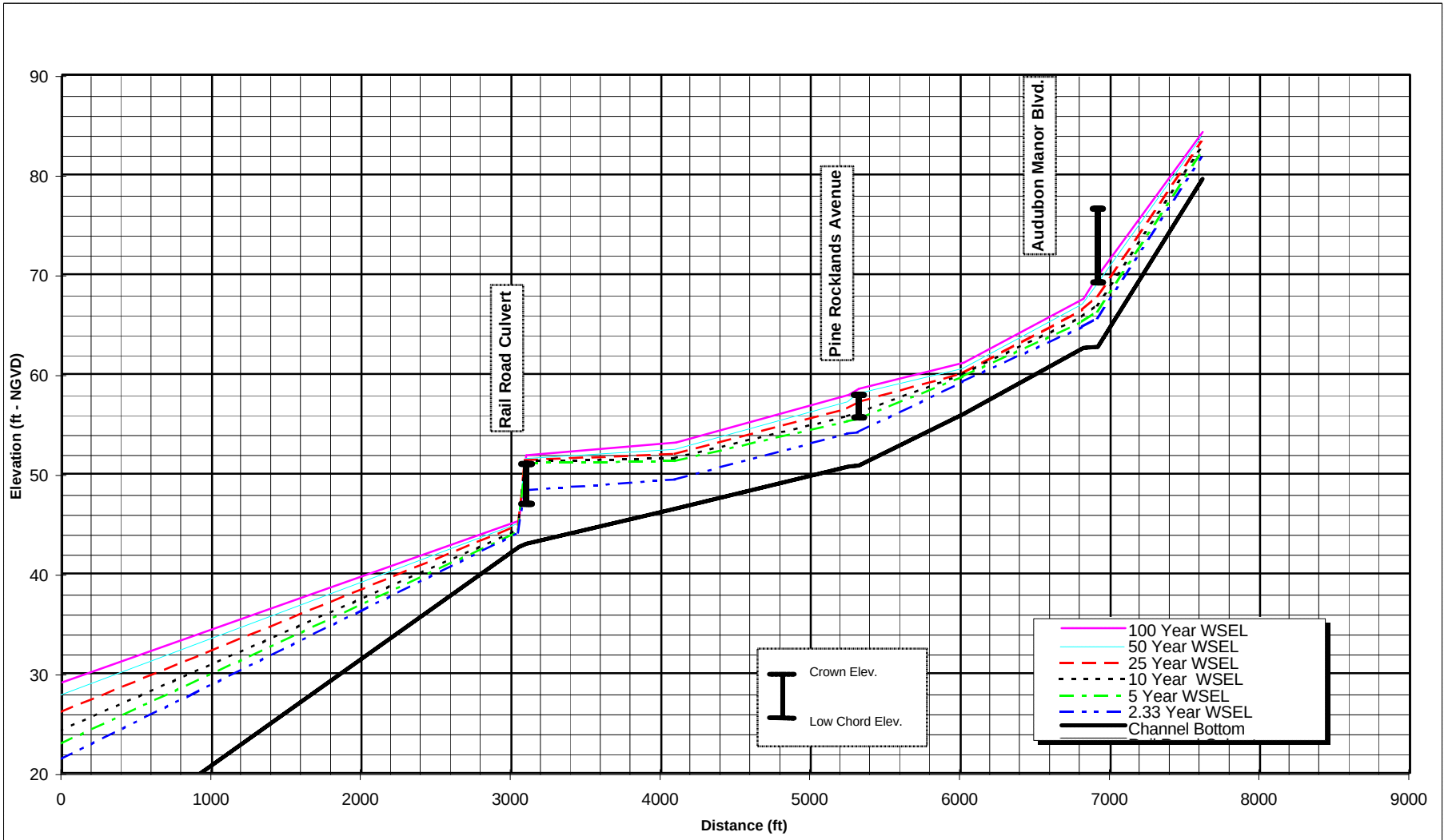
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River / Tributary N-20
Sheet 21 of 25



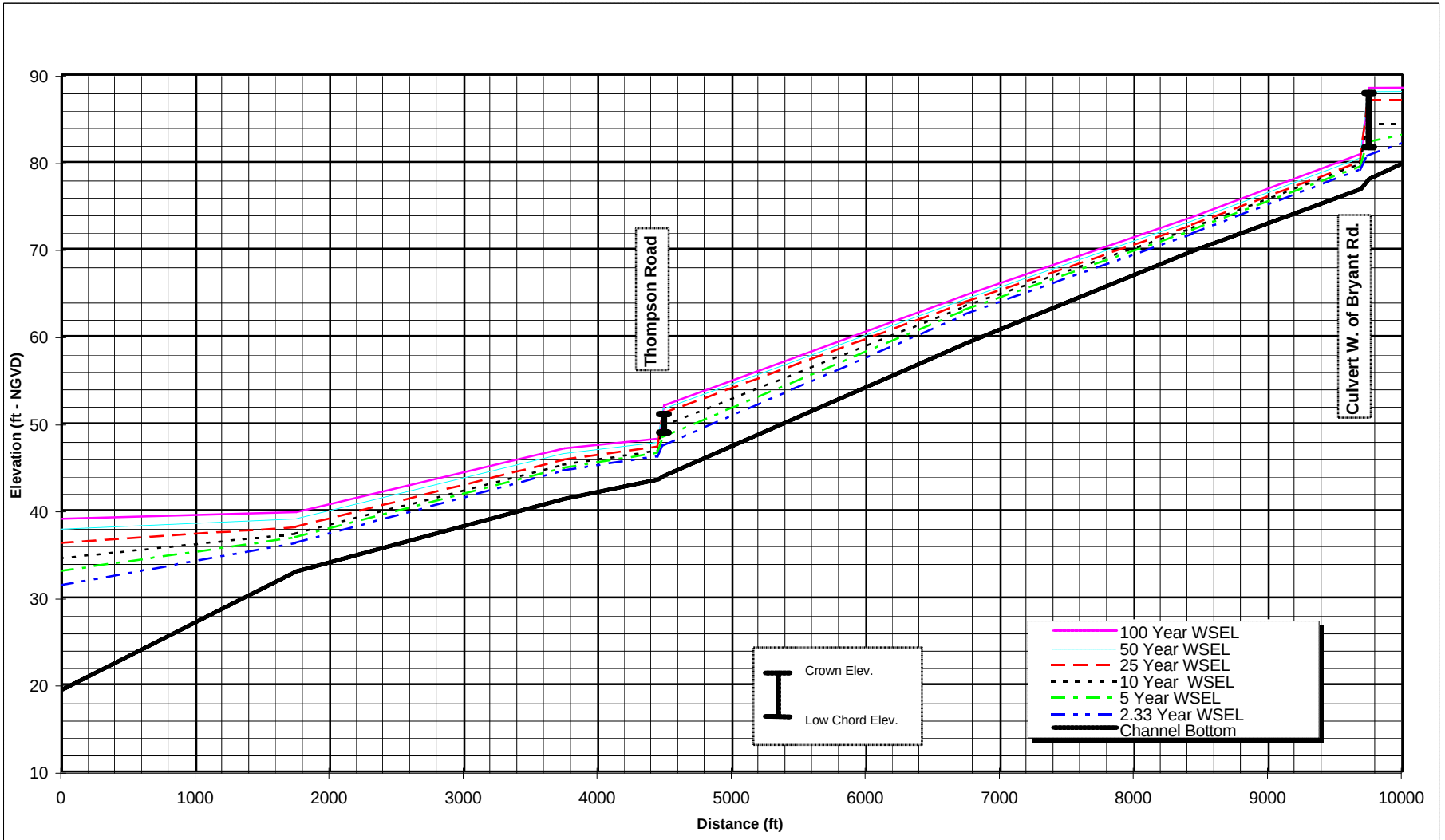
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River / Tributary N-20
Sheet 22 of 25



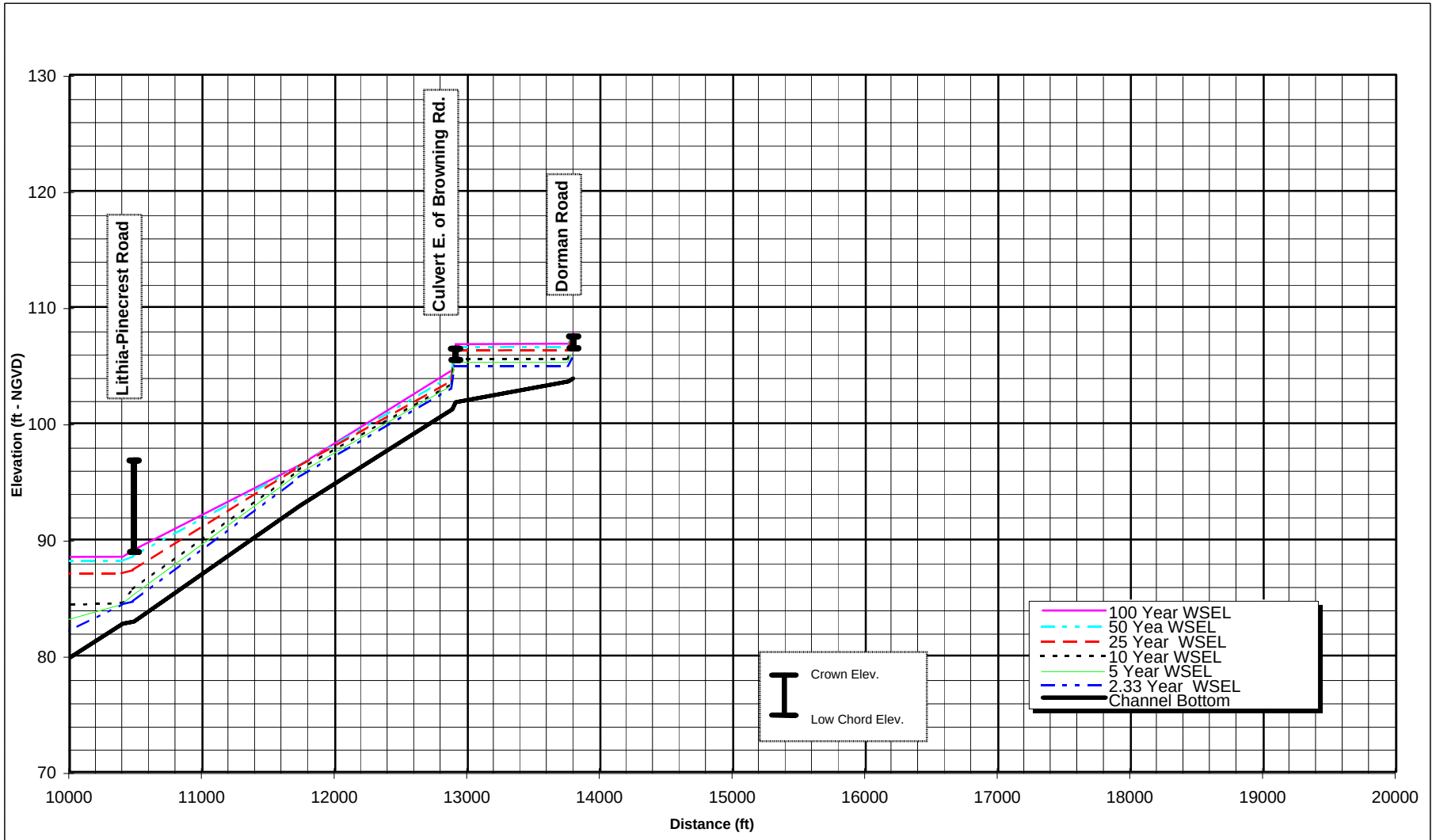
Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River / Tributary S-11
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Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River / Tributary S-12
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Alafia River Main Stem Subwatershed
Master Plan Conditions Flood Profiles
January 2002

Figure 15.2-16
Alafia River / Tributary S-12
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Figure 15.2-17

Alafia River Watershed Management Plan

MASTER PLAN PROJECT LOCATION MAP

R 19 E | R 20 E | R 21 E | R 22 E | R 23 E

T 28 S | T 29 S | T 30 S | T 31 S | T 32 S

BUCKHORN CREEK
TURKEY CREEK
ALAFIA RIVER MAIN STEM
BELL CREEK
FISHHAWK CREEK
ENGLISH CREEK
NORTH PRONG ALAFIA RIVER
SOUTH PRONG ALAFIA RIVER

BUCK-1 BUCK-2 BUCK-3 BUCK-4 BUCK-5 BUCK-6 BUCK-1/NS
TC-1 TC-1/WQ TC-2 TC-2/WQ TC-3 TC-3/WQ TC-4 TC-4/WQ TC-5 TC-6
AR-1 AR-1/NS AR-1/WQ AR-2 AR-2/NS AR-3 AR-3/NS AR-4 AR-4/NS AR-5 AR-6 AR-7 AR-8 AR-9 AR-10 AR-11
BELL-1 BELL-1/NS BELL-1/WQ BELL-2/NS BELL-2/WQ BELL-3/WQ
FISH-1/NS FISH-1/WQ FISH-2/NS
ENG-1 ENG-1/WQ ENG-2 ENG-2/WQ ENG-3 ENG-4
SP-1 SP-2 SP-3

M L KING BLVD
LUMSDEN RD
BLOOMINGDALE AVE
TRAPNELL RD
LITHIA RD
NICHOLS RD
VALRICO RD N
DOVER RD
TURKEY CREEK RD
BELL SHOALS RD
BOYETTE RD
BALM RIVERVIEW RD
HILLSBOROUGH COUNTY
POLK COUNTY

4 75 92 301 41 39 60 676 672

LEGEND

- AR-1 — Flood Control Project Location
- AR-1/WQ — Water Quality Project Location
- AR-1/NS — Natural Systems Project Location
- Subbasin Boundary
- Subwatershed Boundary
- Creek
- River
- County Boundary

Aerial Source:
1999 USGS DOQQ

N W E S

0 5000 10000 15000 Feet

Scale: 1" = 5000'

HILLSBOROUGH COUNTY
FLORIDA

PARSONS ENGINEERING SCIENCE, INC.