7. MASTER DRAINAGE PLAN IMPROVEMENTS

This study has been prepared to facilitate the modeling and consideration of future improvements in this watershed. The level of detail is sufficient for a large watershed, establishing a good baseline for future modeling. Modelers building upon this effort should bear in mind the amount of guessing that was necessary to make up for missing information. As future models are constructed, they should be submitted to the City for review and possible incorporation into future updates of this study. Any new field surveying data would be of particular interest to the City.

The prior Master Drainage Plan study of the St. Julian Creek watershed—completed in 1986—resulted in recommendations for three major watershed drainage improvements. URS carefully evaluated the 1986 recommendations using the modeling results of the current study.

Only part of one of the prior recommendations has been largely accomplished over time—specifically installation of a larger culvert at Deep Creek Boulevard downstream of Camelot Lake. This culvert was installed at the time Deep Creek Boulevard was widened and realigned.

The 1986 recommendations were used as starting points to evaluate future improvements in the St. Julian Creek watershed. After considerable trial-and-error design modeling, recommendations for three improvements were identified and validated. One of the final recommendations is similar to those described in the 1986 study. One of the final recommendations combines the other two 1986 recommendations as part of a more extensive effort. A third recommendation is to improve the drainage east of St. Julian Creek and just downstream of the CSX Railway. The three recommended improvements are shown in Figure 7-1 and described below.

Figure 7-1. Recommended Watershed Improvements

Inherent in these recommended improvements is the assumption that Chesapeake will continue to follow State storm water management and erosion control regulations and guidelines. It is also required that the hydraulic storage capacity and conveyance properties of major drainage system components be maintained as modeled for this study. Specifically, future development plans must not reduce the flood storage that was modeled in this study, and channels and culverts must be maintained to have the hydraulic characteristics as modeled.

In producing the final recommendations, many computer runs were made in an attempt to minimize the cost of the future improvements.

7.1. Camelot Lake Bypass

The need for this improvement was identified in the previous study and validated in the current models. Camelot Lake does not currently meet the City's detention basin storage recovery requirement.

After considerable trial and error, the bypass recommendation consists of the following components:

- A new 4'H x 10'W box culvert 348 feet long, with upstream and downstream inverts of 4.9 and 3.4 feet NAVD, respectively;
- An improved channel with 8-foot bottom width and 2:1 sideslopes, and upstream and downstream inverts of 3.4 and 1.6 feet NAVD, respectively;
- A replacement 3'H x 8'W box culvert under Romaron Street, with upstream and downstream inverts of 1.6 and 1.3 feet NAVD, respectively;
- An improved channel with 8-foot bottom width and 2:1 sideslopes, and upstream and downstream inverts of 1.3 and 0.0 feet NAVD, respectively; and

The proposed bypass is composed of Links 16500 – 16000 in the future conditions model, from Node 1650 to Node 290. The bypass is sized so that 48 hours after the start of a 10-year storm for future conditions land use, Camelot Lake recovers 90% of the storage volume needed for a 50-year storm at existing conditions (i.e., 2004 land use with no bypass).

Figure 7-2 shows the 50-year peak hydraulic grade line values through the bypass from Node 390 to Node 262.

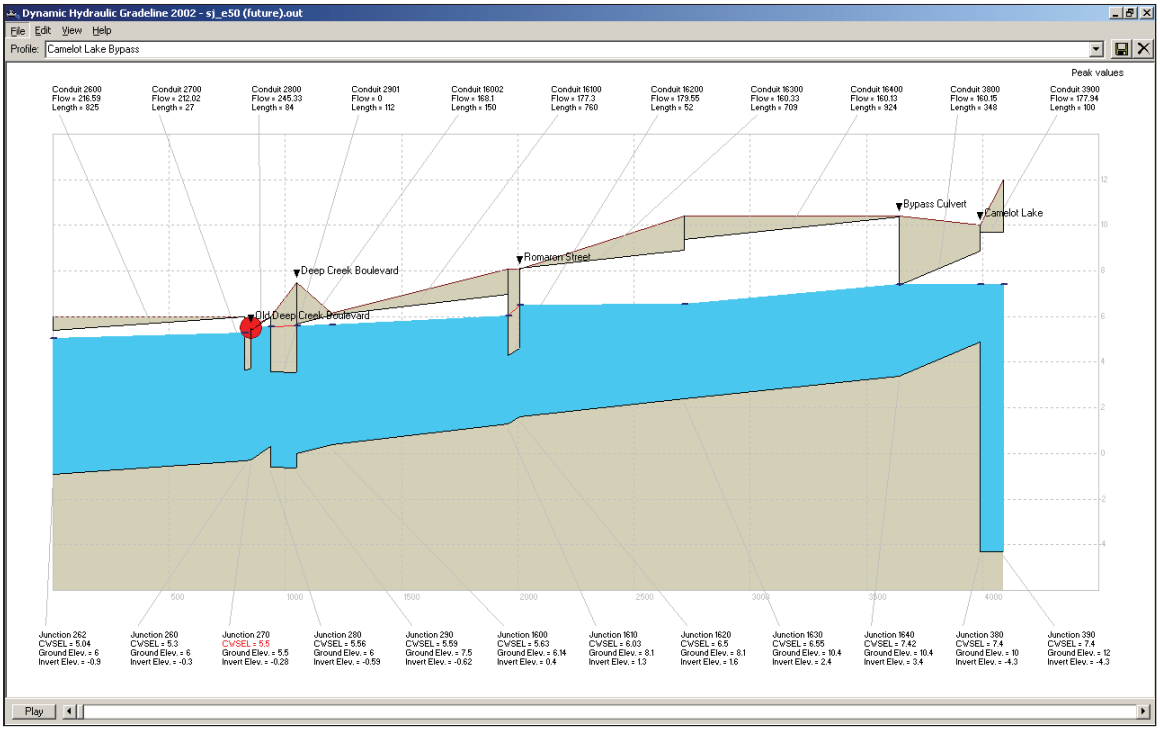

Figure 7-2. 50-Year Peak Hydraulic Grade line From Node 390 Through Node 262

7.2. Portsmouth Outfall – Gust Lane to Deep Creek Boulevard

The next two facility recommendations are required only if the City of Portsmouth opens up the crossings under the CSX Railway, although the models indicate that Deep Creek Boulevard almost floods for the 50-year event under existing conditions. The recommendation consists of the following:

- An additional 72" RCP culvert 40 feet long under the CSX Railway, with upstream and downstream inverts of 0.0 and -0.3 feet NAVD, respectively;
- An improved channel with 30-foot bottom width and 2:1 sideslopes, and upstream and downstream inverts of -0.3 and -1.0 feet NAVD, respectively;
- Two additional 4'H x 6'W box culverts under Deep Creek Boulevard, with upstream and downstream inverts of -1.0 and -1.1 feet NAVD, respectively; and
- Dredging the channel downstream of Deep Creek Boulevard to an elevation of -1.1 feet NAVD so that the culverts are not sumped.

Widening the channel to have a 30-foot bottom width in this location has several benefits, including increased conveyance capacity for upstream flows, and increased flood storage within the channel. The modeling effort indicated that without this additional conveyance capacity and storage, flows will overtop the existing channel banks, and nodal flooding will occur. Several different widths were tried, and a 30-foot bottom just barely provides the needed hydraulic capacity. Given the lot line configurations and available remaining land after existing and future development is considered, a 30-foot bottom should fit well on the site.

The proposed 72" RCP culvert is Link 15232, from Node 1523 to Node 1520. The proposed 30-foot wide channel is Link 15200 in the future conditions model, from Node 1520 to Node 1519. The proposed 4'H x 6'W box culverts are Links 15192 and 15193, from Node 1519 to Node 1515. The proposed dredging is on the upstream end of Link 15150, between Node 1515 and Node 1514.

Figure 7-3 shows the 50-year peak hydraulic grade line values through St. Julian Creek from Node 2521 to Node 1514.

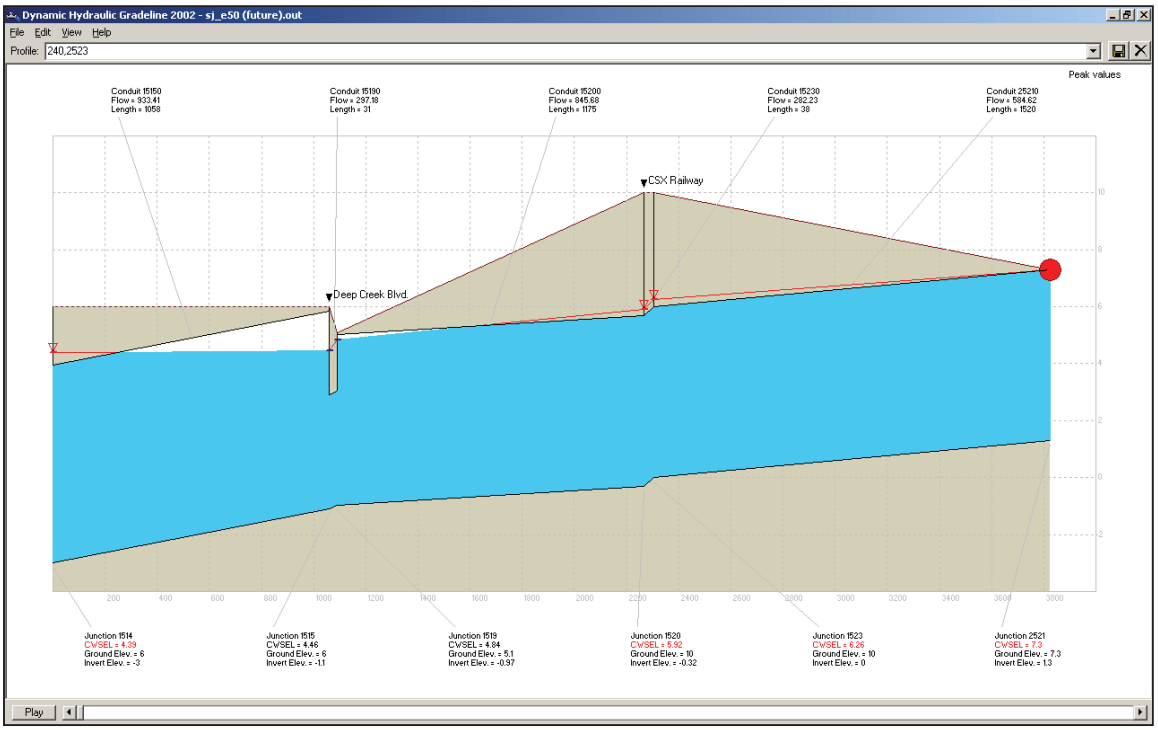

Figure 7-3. 50-Year Peak Hydraulic Grade line From Node 2521 Through Node 1514

7.3. Portsmouth Outfall – West of U.S. 17

As with the previous facility, this project is required only if the City of Portsmouth opens up the crossing under the CSX Railway. The recommendation consists of the following:

- An additional 60" RCP culvert 40 feet long under the CSX Railway, with upstream and downstream inverts of 1.87 and 1.76 feet NAVD, respectively;
- An improved channel with 15-foot bottom width and 2:1 sideslopes, and upstream and downstream inverts of 1.76 and 0.5 feet NAVD, respectively; and
- Dredging the channel downstream of the improved channel to an elevation of 0.5 feet NAVD.

The proposed 60" RCP culvert is Link 25122 in the future conditions model, from Node 2512 to Node 2513. The inverts are set to those assumed for the existing culvert, whose geometric properties were visually estimated during a field visit and tied to the City's GIS spot elevation nearby on the CSX Railway. The improved channel is Link 25130, from Node 2513 to Node 2514. The proposed dredging is on the upstream end of Link 25140, between Node 2514 and Node 1514.

Figure 7-4 shows the 50-year peak hydraulic grade line values through the Portsmouth Crossing west of U.S. 17 from Node 2511 to Node 1514.

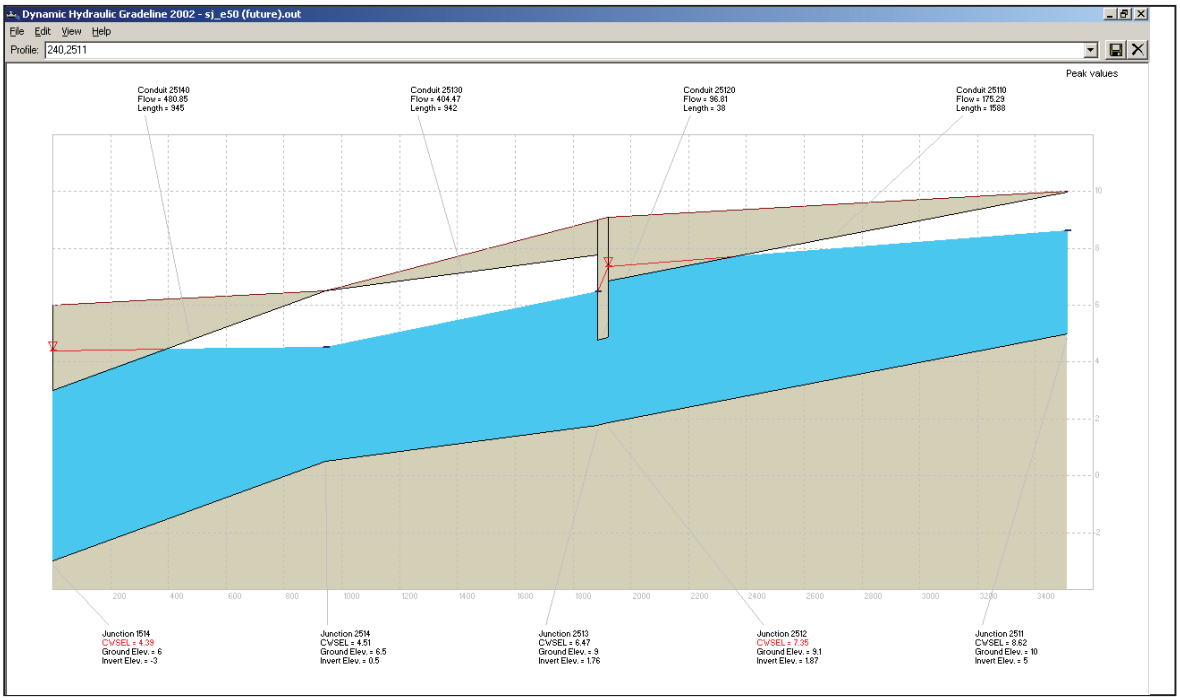

Figure 7-4. 50-Year Peak Hydraulic Grade line From Node 2511 Through Node 1514