

NO: C006

COUNCIL DATE: October 5, 2009

COUNCIL-IN-COMMITTEE

TO: **Mayor & Council** DATE: **September 23, 2009**
FROM: **General Manager, Engineering** FILE: **5225-60**
SUBJECT: **Serpentine and Nicomekl Lowlands Flood Control Project Update**

RECOMMENDATIONS

The Engineering Department recommends that Council receive this report as information.

INTENT

The purpose of this report is to provide information about the status of construction of flood control works in the Serpentine and Nicomekl lowlands.

BACKGROUND

In 1997, the City embarked on an ambitious program to address lowland flooding in the Serpentine and Nicomekl floodplains. Through this program, the City has been actively planning, designing, and constructing dykes, pump stations, and storm water conveyance improvements within the agricultural lowlands.

The intent of the Serpentine and Nicomekl Lowlands Flood Control Project (the Project) is to control flooding within the agricultural floodplain, and establish a set level of service that can support and promote agricultural activities within the floodplain. The standard that is being applied is referred to as the ARDSA Criteria (Agri-Food Regional Development Subsidiary Agreement). This criterion seeks to:

- Restrict flooding to a maximum of 5 days in duration for the 10-year, 5-day winter storm (November 1 to February 28).
- Restrict flooding to a maximum of 2 days in duration for the 10-year, 2-day growing season storm (March 1 to October 31).
- Maintain a minimum baseflow level of 1.2m below adjacent ground level in ditches between storm events during the growing season.

Implementation Constraints

The Project was originally scheduled over 10 years and its cost was estimated at \$40 million (in 1997\$). Since 1998, the City has undertaken construction of the Project on a phased annual basis, with expenditures to date totaling \$35 million. The majority of the original scope of the Project has been completed.

There have been some challenges along the way in completing the Project in its original timeframe including:

- dyke failures due to soft underlying soil conditions (every failure results in at least a 3-year completion delay of the failed section);
- shortage of suitable dyke construction material, which was generally obtained at no cost; and
- restrictions by property owners on the original construction schedule due to crop related concerns on adjacent lands.

DISCUSSION

Serpentine River

By the end of 2010 only minor dyke construction activities will remain to complete along the Serpentine River.

Eight (8) new pump stations have been constructed along the Serpentine River to complement the five pump stations that existed on this River in advance of this Project. The 13 pump stations act to pump water over the dykes into the River during and after storm events when the water level in the River is high compared to the elevation of the tributary ditches. One additional pump station is still to be constructed in the Central Serpentine area (North Cloverdale – Cell F) and pump station improvements are required at the 148 Street (Panorama) pump station.

To convey water to the pump stations, the City has undertaken an extensive ditch construction and improvement program, which is an addition to the original scope of the Project. These works enhance the benefits of the dyke and pump station improvements. Through detailed analysis of each functional plan area, conveyance plans were developed to effectively convey floodplain drainage and floodwater resulting from upland development to pump stations and floodboxes. Approximately 15.2 km of lowland ditches have been constructed or improved with 10.7 km of ditch construction or improvements remaining to be completed over the next 5 to 10-year period.

Appendix I illustrates the location of the dyke works and pump stations that form the Project works along the Serpentine River.

Nicomekl River

Dyke construction/improvement along the Nicomekl River commenced in 2005. Since that time, most of the dyke improvements along the Lower Nicomekl River have been completed. Dyke construction improvement works along the Central Nicomekl were initiated in 2008 with completion targeted for 2011.

One new pump station has been added along the Nicomekl River and one existing station has been upgraded to complement the 5 other pump stations that were in existence along this River

prior to the Project. One additional pump station is to be constructed in the Inter-River area and pump station improvements are to be constructed at the Burrows and Southwest Cloverdale pump stations.

Similar to the Serpentine River, the City has also undertaken extensive ditch construction and improvement program, which is an addition to the original scope of the Project for the Nicomekl River floodplain. These works enhance the benefits of the dyke and pump station improvements completed as part of the Project. To date approximately 10.6 km of ditches have been constructed or improved, with 8.6 km of ditch construction or improvements remaining, to be completed over the next 5 to 10-year period.

Appendix II illustrates the location of the dyke works and pump stations that form the Project works along the Nicomekl River.

Temporary Spillways

To assist in ensuring that no lowland properties are negatively impacted during the construction period, the City has been careful to model the drainage conditions at each stage during the construction process and has designed and scheduled the Project works so that floodwaters are equitably dispersed between lowland cells using temporary spillways. In addition to equitably distributing floodwaters, the temporary spillways help to control river water levels until system constraints are removed.

Along the Serpentine River, there were 4 system constraints (mainly river crossings that are lower than the dyke elevation) that needed to be addressed so that the full positive effects of the Project would be achieved. These constraints were:

- Serpentine River crossing at 88 Avenue (completed 2007)
- Serpentine River crossing at 176 Street (86 Avenue alignment) (completed 2007)
- Serpentine River crossing at the Fraser Highway (under construction)
- Latimer Creek crossing at the Terasen Trunk Gas Main (completed 2004)

The Fraser Highway Bridge at the Serpentine River is scheduled for completion in the coming weeks, which is the final significant project in relation to achieving the full benefit of the Project in relation to the agricultural lands in the floodplain. The temporary spillways will be decommissioned in 2010.

Inter Municipal Drainage (Upper Nicomekl Area)

The Nicomekl River, upstream of 184 Street, is a unique floodplain in comparison to the remainder of the Serpentine and Nicomekl floodplain areas in Surrey. It is relatively narrow and as a result the level of flooding experienced in this floodplain is more dramatically impacted by drainage system changes and land use changes; particularly within the Township of Langley and the City of Langley. Both of these upstream municipalities contribute the majority of drainage waters flowing to and through this floodplain. As a result servicing this floodplain to the standard of the ARDSA criteria is difficult.

Upper Nicomekl Flood Control Strategy and related Functional Plan

In 2005, the City of Surrey, in partnership with the Township of Langley and the City of Langley, undertook a study known as the Upper Nicomekl Flood Control Strategy. The objectives for this study were to:

- Determine the impacts of development in the Nicomekl River watershed on flood levels and durations at the borders between the three municipalities;
- Assess the impact of development on flood levels and durations in North Creek, Orchard Creek, Fraser Creek and portions of the Nicomekl River;
- Assess the impact of development, including both upland runoff and channel changes, on flood levels and durations in Logan Creek;
- Develop a flood control strategy for the Nicomekl River that would establish dyke profiles, floodway routes, and required spillway crest elevations and widths so that the dyke could withstand a 200-year return flood; and
- Establish the parameters for the City of Surrey to implement a Functional Plan for the Upper Nicomekl River area (184 Street to 196 Street) with the aim of providing drainage improvements that would achieve a reasonable agricultural standard of service.

The City has now completed the development of the Upper Nicomekl Functional Plan, which identifies opportunities and constraints to effectively service this confined floodplain section using the parameters established by the Upper Nicomekl Flood Control Strategy. Under this Plan, for properties on which flood control cannot be achieved to reasonable agricultural standards, flooding rights-of-way will be established.

Engineering staff has met with the City's Agricultural Advisory Committee, and are preparing to meet with other stakeholders including representatives of the City of Langley, Township of Langley, and the Agricultural Land Commission on the implementation of this Plan. Cost-sharing with both the City of Langley and the Township of Langley will also be discussed. A further Corporate Report will be forwarded to Council once stakeholder consultation is complete (expected by the Spring 2010). The report will provide a more detailed overview of the Upper Nicomekl Flood Control Strategy and cost sharing agreements that will have been negotiated with the City of Langley and the Township of Langley. In the mean time, Engineering staff will continue to ensure that development and infrastructure upgrades in Surrey are completed in a manner that does not negatively impact these neighbouring communities. Both the City of Langley and the Township of Langley will be requested to ensure that development and infrastructure upgrades within their areas of jurisdiction are undertaken in a manner that does not cause negative flooding impacts in this floodplain area of Surrey.

Monitoring Compliance

The Project includes a process for verification of the effectiveness of the Project on the floodplains. This component acts to verify that the outcomes are consistent with the objectives for the Project. Active monitoring of the operation of the floodplains and the drainage control system is occurring using numerous river level, ditch level, and pump operation recorders. These recorders allow the City to monitor the system under storm conditions and make adjustments to maximize the effectiveness of the system.

Stakeholder Communication

As part of the implementation of the Project a Steering Committee was formed. The Committee has met regularly both during the development the Strategic Plan as well as during the

construction phases. The Steering Committee is comprised of land owners of the various geographical regions of the Serpentine and Nicomekl Lowlands who represent various agricultural interests such as dairy, blueberry, and vegetable production. The Steering Committee will remain active until the Project is complete.

The City has also been an active participant at the Surrey Dyking District's monthly commissioner meetings and at their Annual General Meetings providing regular updates on the status of the Project.

Regular progress updates have also been provided to the City's Agricultural Advisory Committee and to the Agricultural Land Commission.

Property Acquisition

Since 1999, the City has been acquiring statutory rights-of-way (SRW) as part of the Serpentine and Nicomekl Lowlands Flood Control Project. Such rights-of-way have been necessary for the dyke improvements, conveyance works, and pump stations along each of the Serpentine and Nicomekl Rivers as well as their tributaries.

In recognition of the significant amount of property that was required to implement the Project and to ensure that compensation was paid equitably, the City, in consultation from the Project Steering Committee developed a model for right-of-way compensation. Since 1999, this model has been amended a few times to reflect changes in the market value of land. Compensation for all rights-of-way obtained to date has been consistent with the compensation model. The acquisitions to date include over 200 statutory rights-of-way for dyking purposes, including a total of 78 km of dykes along the Serpentine River, Nicomekl River, Bear Creek, Hyland Creek, Latimer Creek, and associated tributaries.

There remain 15 separate rights-of-way representing 3.6 km of dykes along the Serpentine and Nicomekl Rivers still to be acquired. The Realty Services Division is currently attempting to finalize these acquisitions. However, should the current negotiations for the necessary rights-of-way fail, the Engineering Department will forward a further report to Council.

Project Cost Estimate

The current estimated cost for the remaining works to complete the Project is \$7.5 million, excluding the costs to acquire "right-to-flood" rights-of-way and the ditch improvement program referenced previously in this report.

It is estimated that the final cost to complete the full Project will be \$45.7 million, which is well within the original estimates taking into account inflation and scope changes. The Project has been delivered below original estimates as a result of:

- sourcing free dyke construction material;
- retaining the Surrey Dyking District and local farmers to assist in completing conveyance construction works;
- using pre-fabricated pump stations (e.g., in 2002 the City ordered 10 compact screw pump stations with delivery over 5 years which provided a significant costs savings);
- retaining contractors using multi-year agreements; and

- working with land owners to secure local excavation disposal sites to reduce trucking costs and disposal costs.

Schedule for Completion of the Dyke Works

Upper Nicomekl Servicing Plan Report to Council
Completion of dyke upgrades

Spring 2010
Summer 2011

Flood Control Benefits

Although the Project is not fully complete, it is already providing significant benefits to the lowlands by reducing the frequency of flooding and reducing the amount of time during which lands are flooded after significant storms.

The project is allowing for intensification of farming activities in the floodplains. In addition, over the past six years over 200 ha of previously fallow land is now being utilized for active farming. Similarly, previously semi-dormant hay fields are now being actively farmed with higher value crops such as vegetables and blueberries.

SUSTAINABILITY CONSIDERATIONS

The Serpentine and Nicomekl Flood Control Project supports the Economic and Environmental Pillars of the City's Sustainability Charter by:

- Enhancing the productivity of agricultural lands within the Serpentine and Nicomekl River floodplains; and
- Minimizing the impacts of development on the natural environment.

CONCLUSION

The Serpentine and Nicomekl Lowlands Flood Control Project is now almost complete and is providing the expected benefits to the agricultural lands within the floodplains by reducing the level, frequency and duration of flood events. This is resulting in increased intensity of farming in these floodplain areas.

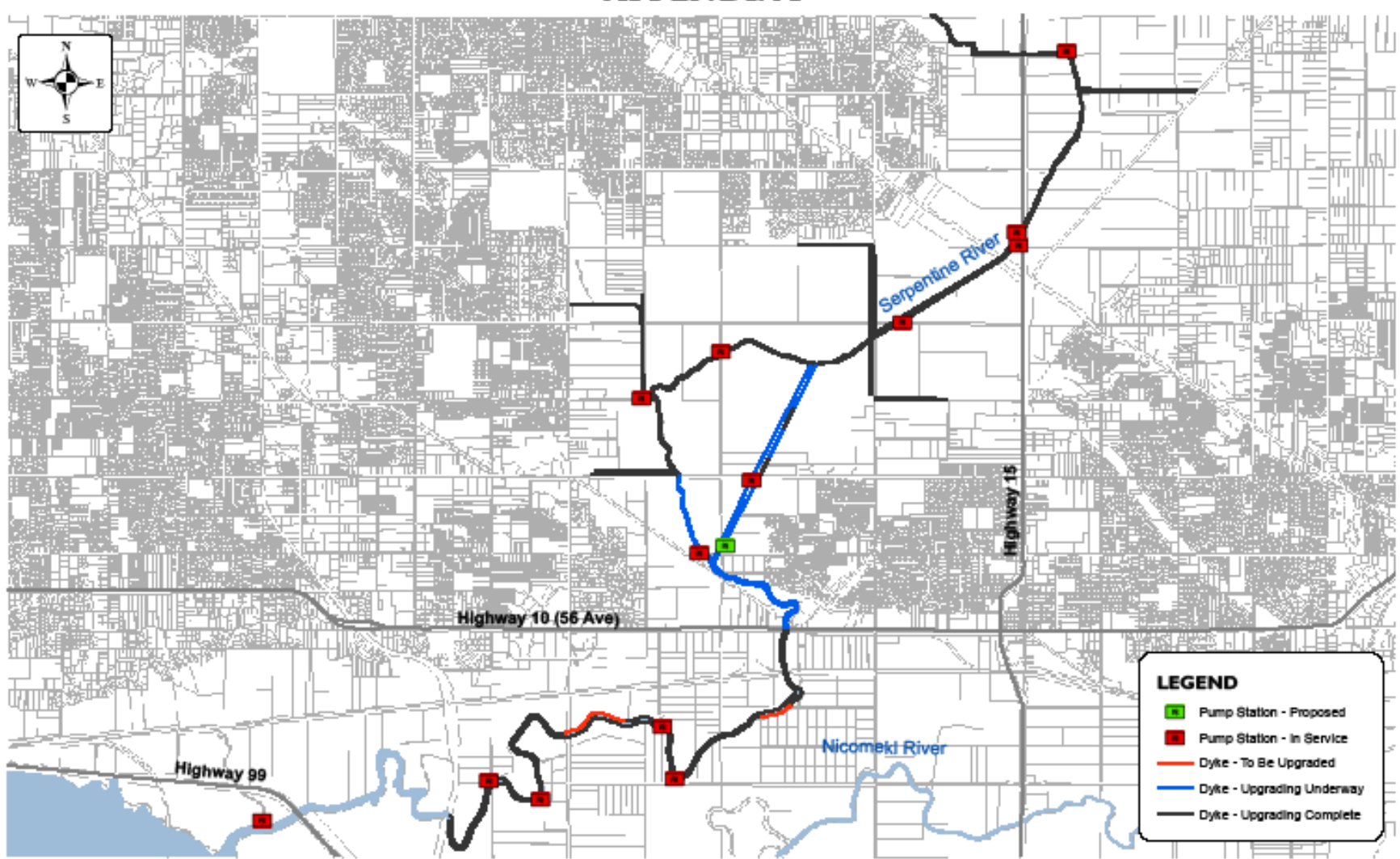
Further reports will be provided to Council in relation to the status of the Project and will include recommendations where appropriate in relation to elements of the Project that remain to be completed.

Vincent Lalonde, P.Eng.
General Manager, Engineering

VL/JA:brb/jkb:kd

Appendix I - Construction Progress Along the Serpentine River
Appendix II - Construction Progress Along the Nicomekl River

APPENDIX I



Produced by GIS Section: August 24, 2009, AIW



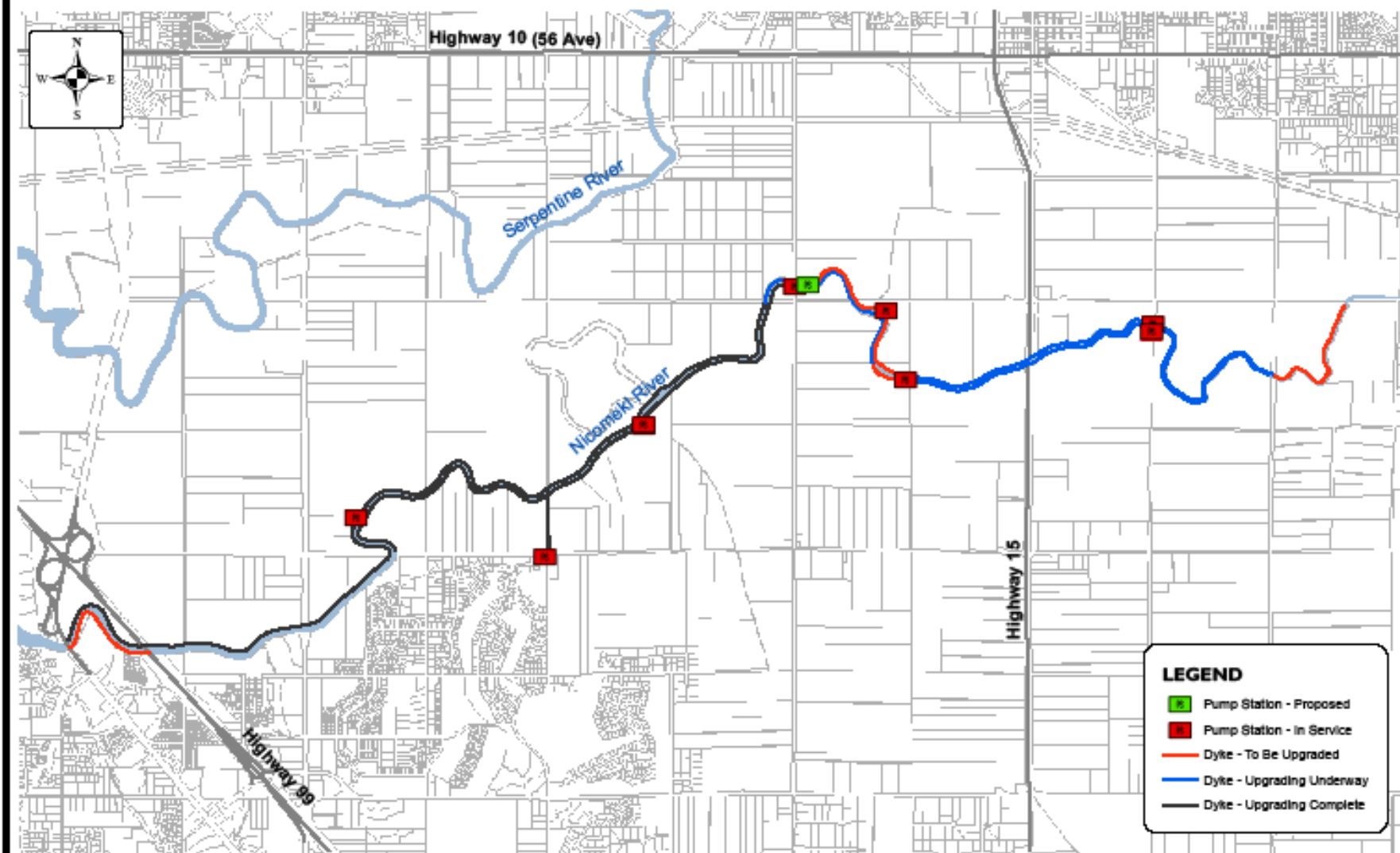
APPENDIX I - Lowlands Flood Control Project - Serpentine River

ENGINEERING DEPARTMENT

The data provided is compiled from various sources and IS NOT warranted as to its accuracy or sufficiency by the City of Surrey. This information is provided for information and convenience purposes only. Lot sizes, Legal descriptions and encumbrances must be confirmed at the Land Title Office.

G:\Mapping\GIS\Maps\Corporate Reports\Eng-Lib\A1W-Jeff\A1W_FloodControl_SerpentineRiver.mxd

APPENDIX II



Produced by GIS Section: August 24, 2009, AYW



APPENDIX II - Lowlands Flood Control Project - Nicomekl River

**ENGINEERING
DEPARTMENT**

The data provided is compiled from various sources and IS NOT warranted as to its accuracy or sufficiency by the City of Surrey.
This information is provided for information and convenience purposes only.
Lot sizes, legal descriptions and encumbrances must be confirmed at the Land Title Office.

G:\Mapping\GIS\Maps\
Corporate Reports\Eng-LB2\New\
AYW\JeffArason_FloodControl_NicomeklRiver.mxd