



PEDRO E. SEGARRA
MAYOR

December 3, 2015

Col. Christopher Barron
Commander and District Engineer
Department of the Army
New England District, Corps of Engineers
696 Virginia Road
Concord, MA 01742

RE: City of Hartford Request for Approval of the System-wide Improvement Framework Letter of Intent (LOI) for Conditional Extension of USACE P.L. 84-99 Program Eligibility for the Connecticut River Right Bank FDR System ("CT Riv RB - Hartford, CT") and the North and South Branch Park River, Park River Conduit Flood FDR System ("N&S Br Park Riv, Park Riv Conduit Sys-Hartford, CT")

Dear Commander:

In accordance with the U.S. Army Corps of Engineers Policy for Development and Implementation of System-Wide Improvement Frameworks (SWIF), the City of Hartford hereby requests approval of this Letter of Intent (LOI) for conditional extension of Public Law (P.L.) 84-99, rehabilitation eligibility while a SWIF is developed for the Connecticut River Right Bank FDR System and the North and South Branch Park River, Park River Conduit Flood FDR System. The SWIF will address system-wide issues, including correction of unacceptable inspection items, in a prioritized way to optimize flood risk reduction.

The attachment contains the information required for the SWIF LOI to demonstrate our commitment to restoring the Connecticut and Park River Flood Damage Reduction Systems to attain compliance with USACE operations and maintenance standards. The City of Hartford is aware of the interim Policy for Determining Eligibility Status of Flood Risk Management Projects for the Rehabilitation Program Pursuant to Public Law (P.L.) 84499 dated 21 March 2014. Specifically, the attachment includes the following detailed information:

- 1) levee system(s) identification;
- 2) a description of deficiencies and/or issues with a justification of how the SWIF will improve and optimize overall flood risk reduction;
- 3) demonstration of funding commitments;
- 4) interim risk reduction measures that will be implemented;
- 5) description of existing and/or planned interagency collaboration; and
- 6) anticipated permit requirements.

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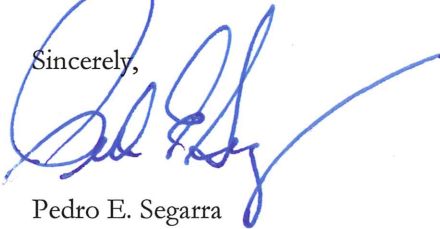


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The attachment further justifies how a system-wide approach will optimize flood risk reduction by correcting deficiencies in a manner that provides the largest flood risk reduction in the most efficient and economical manner. The City of Hartford asks that this initial request be granted for 2 years to allow adequate time to develop a successful SWIF plan.

Should you have any questions or need additional information, please do not hesitate to contact me at 860-757-9500.

Sincerely,



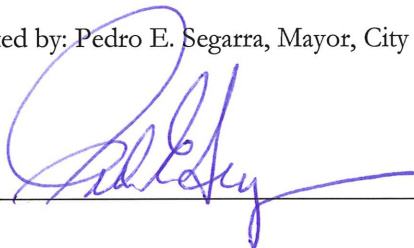
Pedro E. Segarra
Mayor

cc: The Honorable Richard Blumenthal, Washington, DC
The Honorable Christopher Murphy, Washington, DC
The Honorable John Larson, Washington, DC
Dean Savramis, Director, Mitigation Division, FEMA Region 1
Michael McGarry, Chairman, Greater Hartford Flood Commission
Arthur Christian, Connecticut DEEP
Constantin Banciulescu, City Engineer/Assistant Director of Public Works, City of Hartford
Bob Umashankar, Civil Engineer, Department of Public Works, City of Hartford

**City of Hartford, Connecticut Request for Approval of the System-wide Improvement Framework
Letter of Intent for Conditional Extension of USACE P.L. 84-99 Program Eligibility for the
Connecticut and Park River Flood Damage Reduction Systems
Original: March 4, 2015
Revised: November 19, 2015**

Requested by: Pedro E. Segarra, Mayor, City of Hartford

Signed: _____



Date: _____

12/3/15

INTRODUCTION

The City of Hartford is requesting approval of the System-wide Improvement Framework (SWIF) Letter of Intent (LOI) for continued rehabilitation eligibility for the Connecticut River Right Bank Flood Damage Reduction (FDR) System and the North and South Branch Park River, Park River Conduit FDR System under P.L. 84-99 while developing a SWIF. This attachment describes unacceptable deficiencies in the levee system and/or system-wide issues that will be addressed under the SWIF, and justifies how a system-wide approach will optimize flood risk reduction (i.e., will correct deficiencies in a manner that provides the largest flood risk reduction in the most efficient and economical manner.)

The “Unacceptable” deficiencies are described below in Paragraph 2, “Description of Deficiencies and Proposal for Using the SWIF Approach,” and have resulted in the levee systems being put on “inactive” status in the U.S. Army Corps of Engineers (USACE) P.L. 84-99 Program. As such, the Connecticut River Right Bank FDR System and the North and South Branch Park River, Park River Conduit FDR System are currently ineligible for federal funding for repairs if they are damaged during a flood event. The City of Hartford is seeking conditional reinstatement of P.L. 84-99 eligibility by developing and executing a SWIF plan to correct complex deficiencies.

Since the most recent USACE Routine Inspection of the Connecticut River Right Bank FDR System [“CT Riv RB - Hartford, CT” (#4305000011)] and the North and South Branch Park River, Park River Conduit Flood FDR System [“N&S Br Park Riv, Park Riv Conduit Sys-Hartford, CT” (#4305000032)], both dated June 3, 2013, the levee sponsor, the City of Hartford, has made progress toward correcting identified deficiencies, including a 2013 approval by the mayor’s office to allocate \$4,200,000 for system improvements. The following projects have been completed following the June 2013 inspection:

- *North & South Meadows Storage Pond Dredging & Restoration Project* – This sizeable project, which was substantially completed in September of 2013, involved the dredging and disposal of approximately 51,000 cubic yards of contaminated sediment to restore the storage ponds upstream of the North and South Meadows Pumping Stations to their original dimensions and storage volume. Improvements also included the clearing of trees around the perimeter of the ponds; construction of

access roads around the ponds; armoring of the inlets; construction of sedimentation forebays to reduce future sedimentation; installation of a water main for pump cooling at North Meadows; concrete repairs to the South Meadows Pumping Station intake structure; and the placement of plantings in cleared areas.

- *Levee System Improvements* – In the spring of 2014 a contract for on-going maintenance and operations of the levees and floodwalls was awarded for a three-year maintenance period. In 2014, the contractor performed clearing along the entire levee system to remove heavy vegetation. This included clearing vegetation too large to mow in grassed areas, clearing and applying herbicide in riprap areas, and clearing vegetation from drainage ditches. Approximately 400 animal burrows were also repaired.

In addition, the following projects are currently in progress:

- *Bulkeley Bridge/South Meadows Under-Seepage Monitoring* – The City has performed monitoring using recently installed piezometers to measure levee under-seepage at the Bulkeley Bridge and South Meadows, as results have indicated potential for under-seepage during very large floods. This monitoring needs to continue going forward. A short term action plan will be developed with the Connecticut Department of Transportation (CT DOT) to respond to potential issues during high Connecticut River flood levels.
- *Levee System Operations* – Spring and fall mowing and ditch clearing will also occur during 2015 and 2016. Animal burrow formation will continue to be monitored and repaired as required for the duration of the contract.
- *South Meadows Pumping Station Pump Improvements* – Four of the six pumps at South Meadows required repairs to address deficiencies with the pump shafts and seals, bearings, gear box support, and oiler assemblies. Rehabilitation of pumps #1, #2, and #5 have been completed and the rehabilitation of pump #6 is currently on-going. The repairs are being performed on one pump at a time to minimize loss of station capacity.
- *Additional South Meadows Pumping Station Pump Improvements* – The remaining two pumps at South Meadows also required repairs to address deficiencies. This project is currently under construction (\$3,800,000). In addition, the project includes replacement of all 12 pump suction and discharge valves, rehabilitation of the electronic operators, and sump pumping and safety improvements.
- *Pump Station Training Program* – This project includes the preparation of documentation to assist the City in the training of personnel to operate the pump stations. During significant flood events, the dedicated flood control staff cannot operate all facets of the flood control system. To aid in flood control operations, staff from other departments within Public Works is used to operate the pumping stations. The documentation includes training videos and streamlined operational guidance materials that assist non-flood control staff to operate the pumping stations. The City is currently reviewing a draft version of the program.
- *North Meadow and South Meadows Pump Station Trash Rack Replacement* – This project includes the design and installation of a new bar screen, cleaning mechanism, and related structural repairs at North and South Meadows. Plans and specifications are complete and the project shall be submitted for competitive bids by the end of October 2015.

- *Weston Street Drainage (Phase 1B)* – This project includes construction of remaining improvements needed to correct interior drainage problems in the North Meadows area. Phase 1B is the portion of the project that could not be previously completed due to an electric utility conflict. The City has worked out an agreement with Eversource to provide a temporary electrical service to allow for the construction of the drainage improvements. Contract documents are currently being prepared for this work.
- *Closure Structure Upgrades* - This project (\$785,000 – Contract) calls for the installation of new concrete sills and aluminum panels in place of the timbers at five locations, and removing the existing steel door and associated hardware on Riverside of Floodwall and filling the opening with reinforced concrete at Connecticut Resources Recovery Authority (CRRA) Facility. The five locations include closures on the Providence and Worcester rail line (Closure #6), CT Southern rail line (Closure #2). The stop logs over the AMTRAK railroad (Closure #1) shall make the subject of a future project due to potential track upgrades in process.

The City of Hartford is seeking to use a SWIF approach to resolve the “unacceptable” items identified during the USACE inspections and restore the levee to current USACE operation and maintenance standards.

DESCRIPTION OF LEVEE SYSTEM DEFICIENCIES AND PROPOSAL FOR USING SWIF

1. Levee System Identification:

1.a. The levee systems covered by this LOI and included in the SWIF are listed in TABLE 1.

TABLE 1 – List of Levee Systems and Segments included in this SWIF LOI request.

Levee System Name and ID Number	NLD Segment Name and ID Number	Latest Segment Date and Inspection Type	Rating	Sponsor Name
CT Riv RB - Hartford, CT (4305000011)	CT Riv RB - Hartford, CT (4304000012)	June 3, 2013 / Routine Inspection	Unacceptable	City of Hartford
N&S Br Park Riv, Park Riv Conduit Sys-Hartford, CT (4305000032)	N&S Br Park Riv, Park Riv Conduit Sys-Hartford, CT (4304000035)	June 3, 2013 / Routine Inspection	Unacceptable	City of Hartford

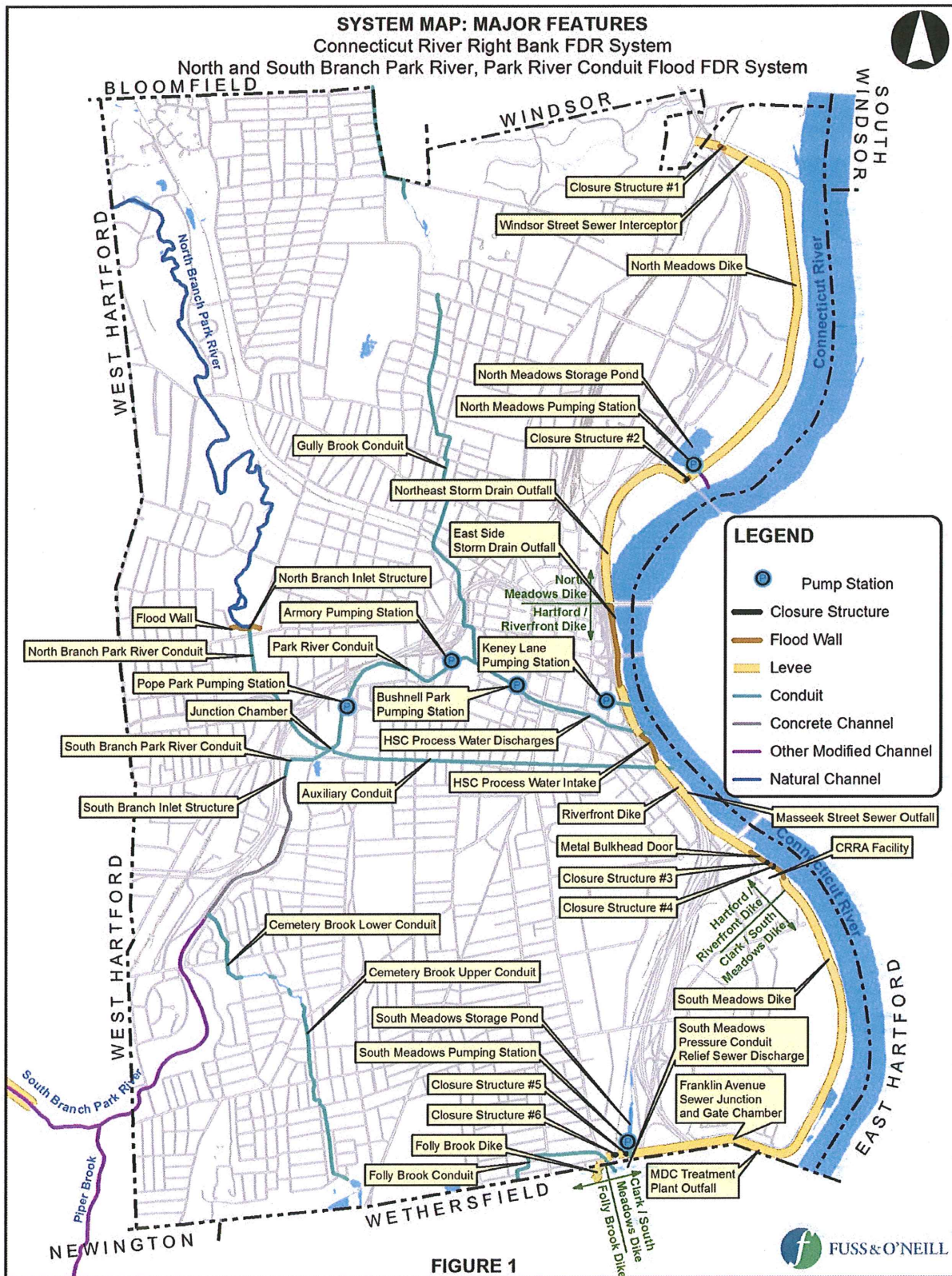
1.b.

The Connecticut River Right Bank FDR System and the North and South Branch Park River, Park River Conduit FDR System work together as one large “flood control system” or “system” to protect the City of Hartford from catastrophic flooding on the Connecticut and Park Rivers. The system is one of the most complex in New England and includes 6.4 miles of earthen dikes, 0.8 miles of concrete floodwalls, seven closure structures, six storm water pumping stations, three pressure conduits, an auxiliary siphon conduit, and appurtenant drainage facilities. The dikes and floodwalls extend along the entire eastern boundary of the City,

from high ground near the Hartford-Windsor boundary on the north to high ground near the Hartford-Wethersfield boundary on the south. The seven closure structures are located along this line, providing passage through dikes and floodwalls for rail, vehicle, and foot traffic while the Connecticut River is at safe levels. When river levels rise and storm water outfalls must be closed, accumulating storm water is evacuated from protected areas by the six pumping stations. The three pressure conduits convey flows from the Park River, Folly Brook, and Gully Brook safely through the City and prevent backwater flooding from the Connecticut River.

The system protects about 3,000 acres of highly developed residential, commercial, and industrial areas in the capital City of Hartford from flooding, primarily within the Downtown, Sheldon/Charter Oak, North Meadows, and South Meadows neighborhoods. The population at risk (PAR) of the Connecticut River Right Bank FDR System is 11,120 day and 3,417 night. The PAR of the North and South Branch Park River, Park River Conduit FDR System is 327 day and 348 night. A map of the leveed area is included as Figure 2.

The Connecticut River portion of the project (dikes and floodwalls) was built based on a design flood of 360,000 cubic feet per second (cfs) The Park River portion of the project (Park River Conduit and Auxiliary Conduit) was built based on a design peak flow of 32,000 cfs, with a peak combined conduit capacity of 23,800 cfs with the Connecticut River at a stage of 30 feet. The remainder of the flood peak is temporarily stored in the channel and floodplain of both the North and South Branch Park Rivers, upstream of the conduits. A map of the system is included.



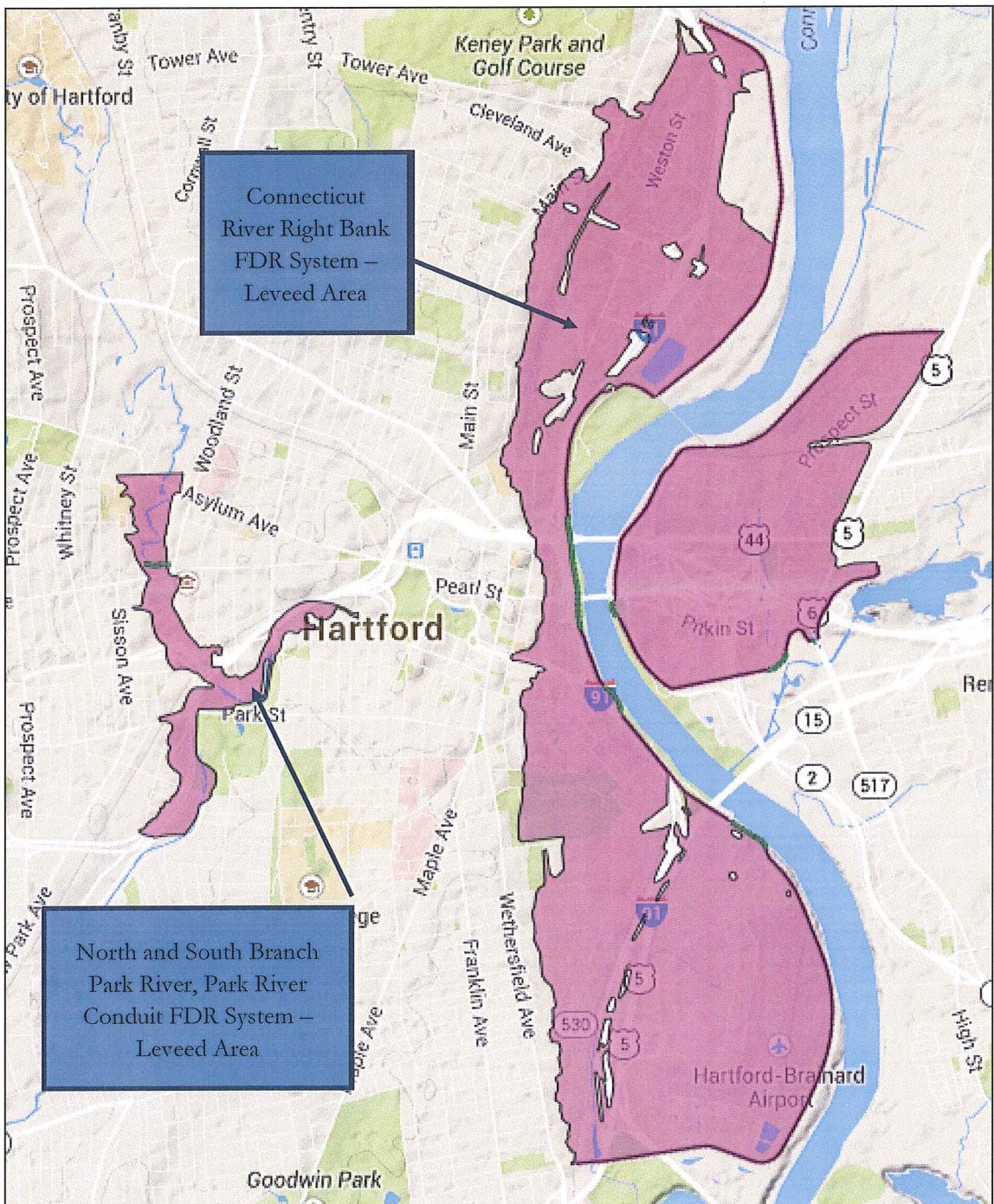


Figure 2. Leaved Area

2. Description of Deficiencies and Proposal for Using the SWIF Approach

The most recent Routine Inspection reports “Routine Inspection of the Connecticut River Right Bank Flood Damage Reduction (FDR) System (“CT Riv RB - Hartford, CT” (#4305000011)) and the North and South Branch Park River, Park River Conduit Flood FDR System (“N&S Br Park Riv, Park Riv Conduit Sys- Hartford, CT” (#4305000032)), both dated June 3, 2013, rated the systems unacceptable. Based on the results of the June 3, 2013 Routine Inspections, the following corresponding unacceptable rated items in the PL 84-99 Interim Eligibility Checklist are listed in TABLE 2.

TABLE 2 – List of Unacceptable Rated Items in the PL 84-99 Interim Eligibility Checklist (based on the June 3, 2013 Routine Inspection).

Category	Rated Item	Comment/Recommendation	Priority Rank
CT Riv RB - Hartford, CT (4305000011)			
Levee Embankments	11. Culverts/Discharge Pipes (This item includes both concrete and corrugated metal pipes.)	<ul style="list-style-type: none"> Provide inspections within the past five years of the Windsor Street Sewer Interceptor 	1
Interior Drainage system	9. Culverts/Discharge Pipes	<ul style="list-style-type: none"> Inspect all interior drainage system culverts and discharge pipes 	2
Levee Embankments	14. Underseepage Relief Wells/Toe Drainage Systems	<ul style="list-style-type: none"> Inspect toe drains 	3
Floodwalls	8. Underseepage Relief Wells/Toe Drainage Systems	<ul style="list-style-type: none"> Inspect toe drains 	4
Levee Embankments	4. Closure Structures (Stop Log, Earthen Closures, Gates, or Sandbag Closures)	<ul style="list-style-type: none"> Repair cracking at closure structures #1 and #2* Perform and document trial closures at closure structures #1, #2, #5, and #6 Perform vegetation removal at closure structure #2* 	5
Floodwalls	5. Tilting, Sliding, or Settlement of Concrete Structures	<ul style="list-style-type: none"> Establish a program for monitoring the tilting floodwall* 	6
Floodwalls	3. Closure Structures (Stop Log Closures and Gates)	<ul style="list-style-type: none"> Sand and paint the metal bulkhead door at the CRRA facility 	7

N&S Br Park Riv, Park Riv Conduit Sys-Hartford, CT (4305000032)			
Interior Drainage system	9. Culverts/Discharge Pipes	<ul style="list-style-type: none"> • Provide inspections within past five years of Folly Brook, Gully Brook and Park River Conduits and lateral sub-drains 	1
Pump Stations	17. Intake and Discharge Pipelines	<ul style="list-style-type: none"> • Repair corrosion and cracked flanges at Pope Park Pump Station intake and discharge lines* • Repair corrosion at Armory Pump Station intake and discharge lines* • Repair corrosion at Bushnell Pump Station intake and discharge lines* 	2

* High priority item for corrective action under the SWIF program.

Given the complexity of both the engineering design and physical deficiencies listed in TABLE 2, including improvements to multiple levees and conduit systems, repairs to closure structures (both levee embankments and flood walls), and intake and discharge pipelines, such efforts would be best completed through a SWIF process. The SWIF process will also be able to account for the time necessary to implement required programs involving critical natural resource considerations as well as coordinate with other major entities including the CT Department of Transportation, The Metropolitan District Commission (MDC) and the Railroad. The levee sponsor will generally take a “fix the worst deficiency first” prioritized approach with the overall goal of correcting the deficiencies listed in TABLE 2. The SWIF process will be utilized to risk rank the deficiencies collectively for both systems to optimize flood risk reduction. The “Interim Eligibility Criteria” checklist items listed in TABLE 2 are considered high risk deficiencies by the USACE.

System improvements will be undertaken with the goal of first addressing the USACE identified deficiencies in its inspection reports. Then the City of Hartford will prioritize and plan for capital improvements necessary to maintain the vitality of the flood control system. Several of the deficiencies are related to routine inspection of system components, such as inspections of the Windsor Street Sewer Interceptor and other culverts and discharge pipes, which will be conducted as part of future routine inspections and issues identified will be addressed in the SWIF. Any deficiencies identified during the completion of routine inspections will be added to the SWIF project list. Additional long-term capital improvement projects not previously referenced may include:

- *Bulkeley Bridge Underseepage Mitigation* - The Hartford levee system is generally underlain by a layer of clean high permeability sand which presents the potential for levee underseepage. Most of the Hartford levee system was constructed with a sheet pile cutoff wall that fully penetrates the alluvial sand deposits; however, a 3,000 foot long section in the vicinity of the Bulkeley Bridges has very short sheet piles which do not penetrate the permeable sand layer. A simple gravel toe drain (without

pipings) was also constructed along the landside toe of the floodwall footing. Previous seepage analyses predicted that for floods exceeding the 100 year event, the USACE maximum allowable underseepage criteria would be exceeded. Piezometric readings during moderate flooding in 2011 showed that landside groundwater levels react very rapidly to rising Connecticut River flood levels, which is a direct indication of underseepage. These piezometric results thus confirmed the analytical finding of excessive underseepage. This underseepage could lead to localized flooding, undermining, and ultimate failure of the flood wall. This project calls for installation of an underground cut-off wall system using either sheet piling, grout/slurry wall, or other methods.

- *North Meadows Dike Toe Drain Installation* - Based on the available toe drain information, many of the toe drain filter materials are likely to either be clogged or allow the loss of fine sand and silt particles from the adjacent embankment and foundation materials. Some of the existing toe drains are not equipped with piping, manholes, cleanouts, or other access points, and are not readily accessible for inspection and cleaning. Some of the toe drains were constructed with rockfill in place of piping, primarily in the North Meadows Dike. Based on previous condition assessments, the overall functionality of the toe drain system is uncertain. Also, in some instances toe drains have been destroyed or buried due adjacent construction projects, including I-91. Installation of perforated pipe toe drains is required along the North Meadows Dike to bring it into compliance with USACE criteria, if required.
- *South Meadows Dike Toe Drain Installation* - The toe drains along the landside toe of the South Meadows Dike consist of gapped clay pipe segments rather than perforated pipe, as is required by current design standards. Replacement of the existing clay pipe with toe drains made of perforated pipe is required along the South Meadows Dike to bring it into compliance with USACE criteria.
- *South Meadows Dike Impervious Blanket Installation* - During the levee accreditation process it was discovered that the South Meadows earthen levee was lacking the required impervious blanket on the river side of the levee. This project would restore the levee surface to have the correct thickness and type of impervious soil on the river side of the levee.
- *South Meadows Dike Underseepage Mitigation* - Piezometer readings taken over the last several years indicate that groundwater levels are reacting to river levels adjacent to the South Meadows Dike. This project seeks to determine the specific causes of the under-seepage and if found necessary would further undertake upgrades to the levee in this area. The South Meadows Dike Toe Drain deficiencies are interrelated with the South Meadows Toe Ditch and its Impervious Blanket deficiencies. These issues need to be addressed in a comprehensive manner given their interaction and combined effect on levee seepage and stability. The three components noted above combine to cause high seepage gradients and landside seepage pressures, which increase the potential for boils and piping, thereby significantly reducing levee embankment stability. The toe drain cannot independently collect enough through-seepage to significantly improve levee stability, hence toe ditch modifications and dike impervious blanket improvements are also needed to collectively solve the seepage deficiencies.
- *Concrete Flood Wall Upgrades* - Existing concrete flood wall sections were cast in place with regularly spaced construction/expansion joints, which were installed with water stops to prevent leakage through the joints. This project would seek to replace the flexible joint material, refurbish deteriorated concrete, and investigate and repair the situations where the walls have settled or moved laterally due to support problems.

- *Utility Penetration Abandonment & Modification* - A large number of utilities pass through the levee and flood walls, introducing the potential for progressive seepage, backflow, or destabilization of the levee during a flood event. Planned improvements include properly abandoning utilities no longer in use, and repair or enhanced backflow prevention for those that remain in use. Utility owners include the City, the MDC, and others. The City plans to develop a comprehensive list of the system penetrations, including their current operational status, size/dimensions, ownership, outlet/inlet elevation, and condition. *North Meadows Pumping Station* - Recommended repairs for the North Meadows Pumping Station include replacement of the existing original 36-inch valves and replacement of the smallest 16-inch pump discharge valve; replacement of pump bearings and seals; addition of electronic operators to expedite opening and closing of handwheel-driven valves; replacement of original electrical panels; provision of access to the pump suction chamber for maintenance of the pumps; and installation of an automated bar rack assembly. Additional safety improvements are under consideration including repair of the perimeter fence and equipment shrouds.
- *South Meadows Pumping Station* - In addition to the pump repairs currently underway at South Meadows, the City is also planning for sump pumping improvements; 36-inch valve replacements; replacement of original electrical panels, and replacement of one electronic valve operator which experienced an electrical short during a flooding event.
- *Keney Lane Pumping Station* - The Keney Lane Pumping Station was erected in 1943, and has recently been surrounded by the parking garage for the Convention Center. Recommended improvements for the Keney Lane Pumping Station include replacement of existing valves and pump bearings and seals; replacement of valve operators; addition of walkways to safely access equipment; replacement of existing electrical equipment; and various safety improvements.
- *Bushnell Park Pumping Station* - Recommended repairs for the Bushnell Park Pumping Station include repair of a leaking roof above the screening room; replacement of the 30-inch valves and pump bearings; repair of sluice gate operators at the inlet to the wet well; replacement of existing electrical panels; and various safety improvements.
- *Pumping Station Automation Improvements* - Pumping station automation improvements would include supervisory control and data acquisition (SCADA) to centralize monitoring and operation of all six pumping stations from a single location. Other improvements would include telemetry upgrades to remotely report pond levels, tank levels, intruders, valve positions, etc. and issue alarms to flood control staff and supervisors.
- *North Branch of the Park River Channel Improvements* - The North Branch Park River upstream of the conduit entrance is an unimproved open channel. Trees and other large debris from these areas can clog the conduit entrance, or enter the conduit and obstruct flow at other locations to reduce overall flood capacity. Planned improvements to address this problem include construction of a dual-use maintenance and recreation access road, right-of-way acquisition, vegetation control, and debris management system.
- *Park River Conduit Upgrades* - The sections of the Park River Conduit in the vicinity of I-91 were built circa 1940 and are founded on wooden pilings. Several joints in this area have shown signs of settlement and lateral movement. Causes of the movement need to be investigated, and potentially the conduit may need to be shored up in places to prevent further movement. Also,

construction/expansion joints need to be replaced due to failure to prevent infiltration and further deterioration.

- *Folly Brook Conduit Replacement* - The Folly Brook Conduit was constructed in various phases using different construction techniques and has suffered significant deterioration due to age, substandard initial construction techniques, and the corrosive effects of combined sewer overflows which discharge into this conduit. This project calls for the construction of a new conduit, which would likely have to be constructed parallel to the existing conduit for logistical reasons. This upgrade is needed to allow for reliable future flows of storm and floodwaters, and the increased flows which may result from sewer separation.
- *Cemetery Brook Conduit Upgrades* - The Cemetery Brook Conduit suffers from intermittent sections of open channel that cause multiple inlet restrictions, sections of poor inlet structures, and susceptibility to clogging and overflow due to debris accumulation. This project would seek to improve open channels, stabilize eroded areas, improve inlet structures, and extend sections of the conduit to replace certain open channel sections.

The SWIF will outline deficiencies to be corrected and other proposed system improvements; and will include interim risk reduction measures for unacceptable deficiencies that will be implemented until those deficiencies are corrected.

3. Demonstration of Funding Commitment for SWIF Development and Implementation:

The City of Hartford will secure all funding necessary for the repairs to maintain “Active” status in the USACE P.L. 84-99 Program.

The current and long-term projects outlined above could cost in excess of \$70 million. The City has already allocated \$4.2 million in 2013 for system improvements (see Introduction Section). The City of Hartford FY2015-2016 to FY2019-2020 Capital Improvement Plan currently includes \$65 million to finance flood system improvements. In fact for the fiscal year 2015-2016, the City Council has approved an appropriation of \$20,045,000. As a result of this appropriation, The City has already issued \$9,943,500 as a result of bond sales and therefore this amount is available for spending under various flood control projects. The City is committed to continue routine inspection of system components and address unacceptable conditions of the system that are identified. In addition, the City will explore federal and state funding options, as well as approaching other stakeholders who benefit from the continued operational integrity of Hartford’s flood control system.

4. Interim Risk Reduction Measures:

The City of Hartford will implement interim risk reduction measures (IRRM) to reduce inundation risks posed by the system’s known deficiencies while the long-term and comprehensive SWIF plan is developed to address these issues. These include identified deficiencies with Bulkeley Bridge underseepage, the North Meadows Dike toe drain, the South Meadows Dike toe drain and underseepage, and levee closure structures and utility penetrations, for which the deficiencies are described in Section 2. The proposed IRRMs include structural and nonstructural IRRMs to reduce the probability and consequences of potential inundation. Many of the non-structural IRRMs reference the existing Hartford Local Protection Project Operation and Maintenance Plan for the system (“O&M Plan”) which includes detailed information regarding Flood Preparedness and a Flood Response Plan. In addition, reference is made to City of Hartford’s “Flood Evacuation for Levee Protected Areas - Annex to City’s Emergency Operations Plan” which describes evacuation procedures in the event of a flooding emergency.

The City will implement the following IRRMs immediately upon acceptance of this LOI and continue these measures, as necessary, throughout the development of the SWIF and completion of the rectification work:

1. Bulkeley Bridge Underseepage
 - a. Nonstructural IRRMs:
 - i. Existing piezometers on the landside of the floodwall will continue to be monitored to gain a further understanding of the relationship to elevated river levels. Piezometers will be monitored daily during flood stage in the Connecticut River above El. 16 feet NGVD29 and follow instructions in the O&M Plan Section 6.1.7 and Appendix M based on the water level condition. Piezometers will be equipped with electronic dataloggers which will be set up to record hourly. The City will purchase and install new Dataloggers on key Piezometers to record elevations in support of long term monitoring of piezometers for engineering evaluation of the sheet pile cutoff wall and seepage mitigation system and potential improvement needs. Downloading of the dataloggers will be quarterly. The City will also evaluate

the purchase and installation of remote monitoring equipment and the re-establishment of an internet based application to allow for real time monitoring of the piezometer elevations. Access to the internet site will allow the City and other parties including the Connecticut Department of Transportation, MDC, etc., to receive early warnings that high seepage gradients are occurring and that seepage related problems could develop. This is intended to alert the above entities immediately so that Interim Risk Reduction Measures (IRRM's) can be put in place before the seepage problems become significant. IRRM's may include potential closing of sections of I-91 or individual ramps under severe conditions. The remote monitoring system will also assist City flood control staff when the river is above flood stage to alert them to situations when seepage pressures have reached threshold values in critical areas. Seepage pressures at or above threshold values will trigger a response from flood control personnel consisting of increased patrols in the areas of elevated seepage pressures to identify potential seepage problems (e.g. seeps and boils), and structural IRRM's such as placement of sand bags or other barriers, and other emergency seepage mitigation as required.

- ii. Areas on the interior of the floodwall that may be subject to potential boils or seepage between Station 0+00 to 27+ 95 on the Riverfront (Hartford) Dike and Station 0+00 to 0+64 on the North Meadows Dike will be monitored during flood events in accordance with the O&M Plan Section 9.3.4 and Appendix D. Monitoring of the Bulkeley Bridge area will begin during Phase 1 Flood Response at flood stage 12 feet NGVD29 at the Connecticut River as stated in Section 9.3 of the O&M Plan.
- iii. Communication about any areas that are found to exhibit signs of seepage or boils will be communicated by the City's flood fighting personnel as identified in the O&M Plan, at which time the flood fighting personnel will mobilize and address locally affected areas through use of sand bag rings or other accepted methods. In addition, the City of Hartford's "Flood Evacuation for Levee Protected Areas - Annex to City's Emergency Operations Plan" will be used in the event of a required evacuation.
- iv. Engage the State of CT DOT as the key stakeholder in development and implementation of an Emergency Preparedness Plan (EPP) for dealing Interstate 91. It is anticipated that DOT will need to develop and implement the EPP and any contingency measures given their exclusive control of the I-91 corridor. DOT will need to be engaged due to potential inundation, temporary closure, or damage to the I-91 highway infrastructure. The City will arrange discussions and meetings with DOT to facilitate this.

b. There are no structural IRRMs proposed.

2. North Meadows Dike Toe Drain

a. Nonstructural IRRMs:

- i. Viable toe drains in the North Meadows and Hartford Dike areas will be identified to accommodate field monitoring during flooding conditions. Many toe drain

sections have been rendered inaccessible or unrecognizable due to construction of major facilities adjacent to the levee (Interstate 91 highway embankment and the Hartford Landfill). The first step will be to identify the viable toe drains and prepare basic mapping to accommodate observation by field personnel.

- ii. Areas on the interior of the levee that may be subject to potential boils or seepage between approximate Stations 40+00 and 100+00, and between 140+00 and 168+00 will be monitored during Phase 1 Flood Response at flood stage 12 feet NGVD29 at the Connecticut River as stated in Section 9.3 of the O&M Plan to identify any toe drain failure or poor performance.
- iii. Information about areas that are found to exhibit signs of seepage or boils during flood events will be communicated by the City's flood fighting personnel and sandbagging will be initialed in b) below. The City of Hartford's "Flood Evacuation for Levee Protected Areas - Annex to City's Emergency Operations Plan" will be used in the event of a required evacuation.

b. Structural IRRMs measures:

- i. The City's flood fighting personnel keep a sufficient number of sandbags on hand to "ring" any boils in open areas, or reinforce any surfaces which exhibit signs of seepage. Sand is stockpiled at the DPW yard and at least 1,000 empty sandbags are stored at the North Meadows Pump Station. The City reportedly filled approximately 2,000 bags in an 8-hour period during Hurricane Irene and "Superstorm" Sandy.
- ii. The City will also work with the State of CT DOT and the MDC to identify certain areas that may be allowed to pond in order to create a back pressure against further seepage. This may involve closing certain low lying highway ramps or portions of City streets where water will naturally accumulate and will be allowed to remain as means of resisting further seepage. Areas where filter blankets may be appropriate will also be evaluated and materials necessary obtained.

3. South Meadows Dike Toe Drain and Underseepage

a. Nonstructural IRRMs:

- i. Basic mapping of specific areas where seepage may occur will be prepared in order to facilitate effective observation by field personnel during flooding events.
- ii. Areas on the interior of the levee that may be subject to potential boils or seepage between Stations 6+50 to 125+00 will be monitored during Phase 1 Flood Response at flood stage 12 feet NGVD29 at the Connecticut River as stated in Section 9.3 of the O&M Plan to identify any toe drain failure or poor performance.
- iii. Information about areas that are found to exhibit signs of seepage or boils during flood events will be communicated by the City's flood fighting personnel and sandbagging will be initialed in b) below. The City of Hartford's "Flood Evacuation for Levee Protected Areas - Annex to City's Emergency Operations Plan" will be used in the event of a required evacuation.

- b. Structural IRRMs:
 - i. The City's flood fighting personnel will keep a sufficient number of sandbags on hand to "ring" any boils in open areas, or reinforce any surfaces which exhibit signs of seepage as described in item 1(b) above.

- 4. Levee Closure Structures and Utility Penetrations
 - a. Nonstructural IRRMs:
 - i. The City will inspect closure structures and levee wall penetrations within 6 months of SWIF-program acceptance, beginning with inspections of the largest closures and penetrations. Several structures are under the control of outside agencies, such as the MDC, may take more than 6 months to inspect. The City will work with these agencies to gain permission to inspect the penetrations or rely on documentation of those agencies for their condition.
 - ii. The levee will be inspected in the vicinity of utility penetrations during Phase 1 Flood Response at flood stage 12 feet NGVD29 at the Connecticut River as stated in Section 9.3 of the O&M Plan to identify any visual evidence of poor performance such as sand boils. Although many of the utility penetrations are at grades below the water level on the water side of the levee and not visible on the landward side of the levee, the areas will be inspected for any signs of seepage or boils. Sand bags will be used around any observed seepage or boils as described in b) below.
 - b. Structural IRRMs:
 - i. The City will stockpile sand and have adequate bags to augment closure structure stop logs or aluminum panels.
 - ii. The City's flood fighting personnel will keep a sufficient number of sandbags on hand to "ring" any boils in open areas, or reinforce any surfaces which exhibit signs of seepage near utility penetration locations as described in item 1(b) above.

The most recent public outreach event occurred in 2007, associated with the FEMA levee accreditation program. At that time, information on the flood control system was mailed to property owners located within the area protected by the system and a televised public information meeting was conducted with officials from the City and USACE. The City will conduct public outreach activities to notify the public of the levee condition, provide information for flood evacuation from levee-protected areas and communicate associated risks during the development of the SWIF, likely in spring 2016, which will consist of the following:

- Informational Flyers (Year 1 and Year 2) - The City will prepare and distribute a written flyer which explains the current status of the levee with respect to the SWIF program, and the efforts the City is taking to correct the deficiencies listed in the SWIF. The flyer will contain links to various internet based sites that provide guidance on determining and managing risk associated with living, working, and operating businesses in the levee protected zone. There are approximately 700 property owners within the levee protected zone, the addresses for which will be queried from the City's GIS/Assessor system. The City will provide one initial flyer in the first year of the SWIF and will

provide a second flyer during the early part of the second year of the SWIF program. Following the mailings, a public meeting may be held based on public interest and feedback on the flyers.

5. Interagency Collaboration:

The SWIF will be developed in consultation with the Greater Hartford Flood Commission, the MDC, Connecticut Department of Energy and Environmental Protection (CT DEEP), CT DOT and USACE. This interagency collaboration will continue as SWIF measures are implemented. During this time, progress on SWIF milestones will be monitored and evaluated by USACE. Routine continuing eligibility inspections of the levee system will also be jointly undertaken by USACE and the City of Hartford during the SWIF development and implementation timeline. USACE and the City of Hartford will coordinate inspections during SWIF development and implementation to ensure milestones are being met.

6. Anticipated State and Federal Permit, Analysis, and Consultation Requirements:

The City of Hartford is responsible for continued operation, maintenance, repair and rehabilitation needs on Connecticut River Right Bank FDR System and the North and South Branch Park River, Park River Conduit FDR System. Special permitting may be required by the City of Hartford to perform these activities to ensure operational adequacy of the levee systems.

In general, rectification work will involve the activities listed in Paragraph 2 above. Many of the deficiencies listed in TABLE 2 are for monitoring or inspections and will not require any permits. The following environmental permits may be required for the recommended projects:

- Any work within State or Federal wetlands may require a USACE Section 404 Clean Water Act Permit/Section 401 Water Quality Certification
- Proposed activities that are not considered routine maintenance may require a CTDEEP Dam Safety Permit
- Portions of proposed activities that occur below the coastal jurisdiction line may require a CTDEEP OLISP Structures Dredging & Fill Permit/USACE Section 10 Permit
- Activities within State- or Federally-recognized endangered, threatened, or special concern species habitat may require Endangered Species Act Consultation (U.S. Fish and Wildlife Service and Connecticut Department of Energy and Environmental Protection).
- Substantial alternations to any structures listed or potentially eligible for the National or State Register of Historical Places may require National Historic Preservation Act Consultation including coordination with the State Historic Preservation Office.
- Any modifications to the federal system implemented under the SWIF will be submitted under 44 USC 408 for USACE approval
- Any Vegetation Variances prepared under SWIF will be submitted in accordance with the USACE Policy Guidance Letter for acceptance.

A review of project-based permitting requirements will be provided in the SWIF.

CONCLUSION

Given the anticipated scope of necessary work, the City of Hartford respectfully requests that the levee systems listed in TABLE 1 above retain “active” status in the P.L. 84-99 Program while the SWIF plan is developed. The City of Hartford asks that this initial request be granted for 2 years, to allow adequate time to develop a successful SWIF plan.