MSD
Metropolitan Sewer District

Louisville and Jefferson County Metropolitan Sewer District
700 West Liberty Street
Louisville Kentucky 40203-1911
502-540-6000
www.msdlouky.org

December 12, 2011

[redacted]
Attorney at Law
[redacted] Hepburn Ave
Louisville, KY 40204

Subject: Integrated Overflow Abatement Plan (IOAP)
Public Input Meeting September 27, 2011
Response to comments

Dear [redacted]

Thank you for taking the time to attend the Public Input Meeting September 27, 2011, and to subsequently submit your comments and questions relative to the Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP). Your letter, verbal comments transcription and completed comment form are attached for reference.

Your letter dated October 5, 2011, states your opposition to MSD's decision to fund and build $208,769,000 million or more of gray infrastructure projects in the form of off-line storage basins. Your stated opposition is presented through discussion of four bases, each of which will be responded to individually.

Response to Basis 1

Your statement that the I-64 & Grinstead Drive basin size has been recalculated based on actual system flow measurements is accurate. MSD's approved LTCP dated September 30, 2009, states that the sewer models utilized to size the overflow abatement projects would be re-calibrated periodically to more closely represent true system functionality, as more field monitoring data is gathered. The recent re-calibration effort occurred after MSD installed additional monitoring equipment throughout its 3,200 mile sewer system and gathered data characterizing system function under various real world conditions. Following this effort, the overflow abatement projects are being re-assessed to ensure appropriate sizing of infrastructure to meet regulatory compliance targets. Refer to the compliance monitoring approach that outlines this process in the IOAP Volume 1, Chapter 6, Section 5, which has been included as an attachment.

MSD will continue the aggressive expansion of our sewer and environmental monitoring system for use in re-calibrating its sewer models periodically, assessing drainage area and stream health characteristics and ensuring, to the best of our ability, that the overflow solutions, both green and gray, are sized appropriately.

The revised I-64 & Grinstead basin projected size and cost, as well as other CSO LTCP project revisions, will be presented to the public at the next Public Input Meeting scheduled for January 24, 2012. Projects will continue to be refined as additional system information is gathered and model enhancement is completed.

Response to Basis 2

Your statement that the I-64 & Grinstead Drive basin has not yet been sized with the anticipated implementation of a large green stormwater infrastructure program in the surrounding drainage basin is correct. As approved in the IOAP, this particular basin must be constructed by December 31, 2014. The drainage area for this basin is very large and highly impervious. Some level of green infrastructure implementation is conceptually feasible; however, the effort required for planning, design, construction and post construction monitoring to determine stormwater inflow reductions necessary to complete the gray to green right-sizing effort will take several years to complete. For this effort to be realized, a request to EPA/KDEP for basin construction schedule modification would be required so that green infrastructure can be planned and constructed in this area to achieve some overflow reduction, which could work in conjunction with the planned storage basin. MSD is actively seeking green partners throughout the combined system to implement green practices and discussing possible project schedule revisions with its regulatory agencies.

MSD is currently analyzing the use of targeted green stormwater infrastructure and the potential for achieving the same overflow reduction targets as the offline storage basins in several CSO subbasin areas. Due to the magnitude of the combined sewer system and number of overflow locations (103), it was necessary to prioritize pilot areas for analysis. These basins were selected where green practices could be implemented in a relatively short time frame and monitoring data can be gathered to analyze the collective efficacy of these practices in achieving regulatory overflow reduction targets. The results of this analysis, and its comparison with comparable gray infrastructure, will be published once completed. Lessons learned from these initial areas will then be applied to others.

An ordinance to require green stormwater reduction retrofits on private property requires Metro Council sponsorship and adoption and is subsequently outside of MSD's legal authority. However, MSD is legally responsible for achieving the overflow reductions outlined in the IOAP using the most cost effective methods available. In CSO drainage areas flowing to the I-64 & Grinstead basin, the use of a vast number of rain barrels and enormous amount of green practices on private property is not a feasible means of controlling 15 million gallons of sewer overflow in a given rain event, as MSD must ensure the proper maintenance and operation of these features.

MSD is responsible for the long term achievement of overflow reduction targets, and, therefore, must inspect and maintain the functionality of the practices that are constructed to achieve these reductions. Every quarter and annually, MSD is responsible for reporting progress and the success or failure in meeting these targets to KDEP, EPA and the Department of Justice. Failure to do so by 2020, currently a 9-year window, could result in stipulated penalties and potential default under the Consent Decree.

In larger drainage areas, solely using green infrastructure practices to achieve drastic overflow reductions would make long-term inspection and maintenance impractical from human resource, private property access, and cost perspectives. The 'gray' off-line storage basin that many frown upon is, in its function, a green project as well. The offline basin will keep raw sewage from Beargrass Creek during small to moderate storms and send the sewage for treatment following the storm prior to being discharged into the creek. The operation and maintenance of an overflow control project using an offline storage basin at this scale is much simpler to maintain, more reliable and cost effective than widely dispersed green infrastructure practices.

However, many of the measures that you suggest can be beneficial in providing additional benefit beyond MSD's regulatory level of control. MSD's green infrastructure incentives program encourages the use of green infrastructure in both new development and the retrofitting of existing development. A brochure outlining this program has been attached for your reference. Also, at your request, maps describing the land use and impervious area breakdown for each CSO area contributing flow to the I-64 and Grinstead basin are attached.

Response to Basis 3

MSD agrees that the environmental impact of each project must be carefully considered and mitigated. During the design of each approved IOAP project, environmental impact studies (including impacts to the Indiana bat that you reference) for the finalized project sites will be performed and adverse impacts, if determined, mitigated, per local, state and federal requirements. The public will be kept informed through open public meetings.

Renderings of the Logan Street storage basin were presented to the public at the September 27, 2011, meeting. While the design of each basin will be specifically characterized to fit functional needs, site requirements and neighborhood surroundings, the Logan Street basin is the most representative project currently proceeding in design. Renderings for the I-64 & Grinstead basin will be shared at subsequent public meetings as design proceeds.

Basin re-calibration and green stormwater infrastructure considerations are addressed above.

Response to Basis 4

The proposed long sewer trunk line from Nightingale Pump Station to the Starkey (Buchanan Street) Pump Station that you cite is currently being considered for elimination from the IOAP. The need for conveyance sewers, if deemed necessary for effective overflow control, will be addressed during the planning and design phase of individual projects and presented to the public for discussion and input.

MSD presented the Jeffersontown Water Quality Treatment Center elimination alternatives to the public at a series of public meetings in 2007 and 2008. Progress on the implementation of this plan was also presented to the public at the September 27, 2011, meeting. New sewer infrastructure currently being constructed in the Hikes Point area will enable overflow protection to a much higher level than currently exists.

Thank you for your comments and suggestions, and for taking time to attend the public input meeting. MSD invites you to attend future IOAP Project Input meetings, including the next meeting scheduled on Tuesday, January 24, 2012. The meeting will be held at the Kentuckiana Girl Scouts Headquarters on Lexington Road at 6:30 pm. This letter will be posted on MSD's Project WIN web page at the link www.msdlouky.org/projectwin.

Sincerely,

W. Brian Bingham
Regulatory Services Director

Attachments

[redacted]- Transcribed Comments from September 27th, 2011 IOAP Input Meeting

Question asked immediately following the Project WIN Overview Presentation

[redacted]- "[redacted], I'm a resident of the highlands area. My questions regard the planned gray infrastructure, regarding the CSO basin on Lexington Road and Grinstead Avenue. And, first of all, I want to thank MSD for hosting this open house. It's very much appreciated by those citizens who have followed MSD's work on addressing the combined sewer overflow and sanitary sewer overflow problems in the community, so thank you MSD for that. With regard to the Lexington/Grinstead basin, I had a chance to speak in the other room with some of the MSD engineers and my question is they indicated to me that the, this basin has gone from a 2.74 million gallon projected basin in capacity to a 12 million gallon projected capacity and the cost has jumped from $12,950,000 to $30,000,000 projected cost for a huge basin that will require the bulldozing down of some old growth woods and some displacement of wet lands in the area. I'm asking MSD to provide a robust public consultation process for the Lexington Road/Grinstead basin and one of the information requests that I had, with regard to it, is a cost benefit analysis of what the effect of requiring a metro ordinance for the installation of rain barrels in that contributing sewer shed or water shed would be. My understanding is rain barrels is about 50 gallons storage and for $1,000,000 you could get 5,000,000 gallons of storage versus $30,000,000 for this major gray infrastructure basin. It seems that the cost effectiveness of passing an ordinance requiring homeowners to put a rain barrel in their downspout would be a preferable alternative. And I'd like to see a very careful analysis of that alternative. Thank you."

Question asked immediately following the Jeffersontown Water Quality Treatment Center Elimination Presentation

[redacted]- '[redacted]. I live in the highlands. This very large project which transports sewer water out of one watershed and into another and calls for expenditure of $46,000,000 and the disruption of creek basins and waterways through the installation of multiple miles of sewer, is appropriate for the public to have input on and have a comment on. And I reiterate and support Teena's comments that the public consultation on this selection of these express lines of sewer removal from in the course of closing the J-town plant. This public consultation is coming in on the tail end of the process instead of on the front end of the process where we might have offered some meaningful input. And I think her point was, and my point would be, we've been denied meaningful input into the alternatives and consideration of this project. My information request is that in the installation of this force main in the, what's called the northern section I believe, that will remove 2/3 of the flow from the J-town plant will... I haven't seen any presentation regarding the removal of SSO's from one location to another. We understand that these measures, intended to meet Clean Water Act and EPA directives, are to capture and control sewer overflows through a range of storms, but there will be some range of storms that exceed the capacities of these measures to control. And that will result in major overflows. Are you moving sewer overflows from the J-town watershed, Chenoweth Run/ Floyd's Fork watershed and placing them in the south fork of Beargrass Creek watershed?"

MSD
Metropolitan Sewer District

PROJECT WIN
Waterway Improvements Now

IOAP Public Outreach Meeting

September 27, 2011
3:00 P.M.

CUSTOMER INFORMATION

Name (Last, First) [redacted]

Address [redacted] Hepburn Ave Zip Code 40204

Work Phone [redacted] Home Phone —

Cell Phone ✓

LOCATION OF REQUEST

Address ______ Zip Code ______

Owner [ ] Tenant [ ] Other [ ]

REQUEST TYPE

[ ] Construction issues [ ] public consultation

[✓] Drainage Related [ ] ______

[✓] Sanitary Sewer Related [ ] ______

REQUEST DESCRIPTION

Please calculate cost-benefit of an ordinance requiring installation of rain barrels in the sewersheds of the Grinstead Lexington Road basin. 50 gallons x 100,000 = 5 million gallons storage v. $12 million to store 2.75 million gallons

~~Response:~~ Provide a list in the same CSO 127 basin sewershed of the largest public and private stormwater impervious areas - additional questions and comments will be posted on badwaterjournal.com

please see back

Beneficial Use of Louisville's Biosolids
www.louisvillegreen.com

information request:
map of the properties included in the Lexington Road - Grinsted Basin sewer shed — need info necessary to figure what properties contribute sewer and stormwater flows to the Basin.

MSD IOAP Project Comments
Attention Project WIN Program Manager
700 West Liberty Street
Louisville, KY 40203

October 5, 2011

Dear MSD WIN manager,

I would like to comment as a resident of Metro Louisville affected by MSDs proposed IOAP project, and as someone who hikes along reaches of Beargrass Creek, canoes Floyds Fork, and enjoys the diverse wildlife found along our creeks and the Ohio River.

My comments are not meant to condemn the good efforts of the hundreds of MSD employees that work at tough and essential tasks each and every day.

1.) I oppose MSDs decision to fund and build $ 208,769,000 million or more of gray infrastructure projects in the form of off-line storage basins.

Basis 1: At the Open House, engineers in the IOAP conference room informed me that the computer modeling of sewer overflows was wrong—off more than 50%--when it calculated the basin capacity of 2.74 million gallons for the I-64 Lexington Road basin. The new size would be based on actual flow measurements and the required capacity would be 12 million gallons. The new cost was estimated to be $ 30 million instead of the cost printed in the IOAP Plan.

The public has not seen correct flow and capacity numbers for the multiple IOAP projects in the CSO system. Several of the 13 storage basin capacities will have to be recalculated and the plans reconsidered and presented to the public.

Basis 2: At the Open House, engineers in the IOAP conference room informed me that the capacity calculations for the off line storage basins in the CSO system were not reduced by any reductions in flows for green infrastructure projects. Specifically the Grinstead basin was sized without anticipation of a large green infrastructure program to capture rain water and remove it from the system in the surrounding sewershed.

MSD should draft and Metro Council should adopt changes in the stormwater authority ordinance that authorize MSD to specify and enforce requirements for rain water capture and removal from the sewer system for Class A and Class B properties in the CSO area. Because no mandatory program of rain barrels installation, downspout disconnection, and area drain abatement has been instituted by MSD and Metro government, off line storage basins are unnecessarily over capacity, cost too much, and will result in a heavier burden and more overflows from the collection system. A prioritized mandatory program for removing rain water from the CSO system must be instituted before basins costing $ 208,769,000 are built.

For 2010 census 309,000 housing units in Jefferson county, that's a cost of $ 675.00 each on top of the monthly stormwater and wastewater fees for the basins.

Two rain barrels at each housing unit would cost $ 61 million dollars if they all cost $ 100.00. That project would remove 33.9 million gallons from the CSO system and put it into local lawns and gardens. Doubling the on site storage for another $ 61 million would give 68 million gallons of rain water removal giving more storage than the basins for about $ 80 million dollars less spending.

MSD will surely want more carefully calculated estimates and specific on site conditions will vary. This does not even calculate the millions of gallons that could be removed by prioritizing impervious large parking lots of Class B properties. Please see the online article at:
<http://www.badwaterjournal.com/Bad_Water_Journal/Area_Drains.html>

This is the list of projects in the CSO system as projected in 2009. Could MSD please update and correct the capacity and cost figures?

Integrated Overflow Abatement Plan
Final CSO Long-term Control Plan
List of Gray Infrastructure Projects

150,000	not basin – in line storage
315,000	CSO 123 downspout disconnection
938,000	Adams Street storage basin
+ 1,580,000	Story Ave and Main Street basin
+ 3,842,000	CSO 206 sewer separation
+ 24,940,000	Paddys Run wet weather treatent facility
+ 12,950,000	I-64 & Grinstead basin (now $ 30 million)
+ 1,361,000	CSO 58 sewer separation
+ 3,150,000	CSO 140 Sewer separation
+ 952,000	CSO 93 sewer separation
+ 237,000	CSO 160 sewer separation
+ 15,710,000	Nightingale pump station expansion
+ 1,077,000	Story Avenue at Spring basin
+ 30,320,000	Logan at Breckinridge Street basin
+ 13,720,000	Calvary at Creekside basin
+ 4,514,000	18th at Northwestern basin
+ 12,994,000	New Beargrass Creek interceptor trunk line to Buthchertown
+ 13,870,000	Clifton Heights basin
+ 17,300,000	Algonquin pkwy basin
+ 17,620,000	Southwestern Pkwy basin
+ 20,000,000	Portland Wharf basin
+ 49,680,000	13th and Rowan basin
+ 25,200,000	Lexington Road at Payne Street basin
$ 272,420,000	

Basis 3: The proposed I-64 at Grinstead basin now proposed to be 12 million gallons at a cost of $ 30 million is oversized and wastes money. It is also shown to be installed in a wetlands area of mature trees where the Indiana bat lives. I oppose filling the wetlands with concrete and telling the bat to move somewhere else. First calculate the amount of storage and removal possible by a rain barrel program.

Second calculate the amount of storage and removal by making a mandatory rain capture program for Class B properties and installation of on site rain gardens and other green infrastructure. Then, install all green projects. Then do flow monitoring and calculate the necessary basin size. MSD's aerial mapping size calculation program was off by 50% and cannot be relied upon. That large an error undermines confidence in new even larger projections that ignore low cost rain removal strategies.

MSD has not shown the public any representative designs of a covered underground storage basin at I-64 and Grinstead or anywhere else. MSD has not shown any specific location for the basin or accurate footprint in the area. The extent of wetlands destruction and mature woods destruction has not been discussed and green alternatives have not been explored.

Basis 4. The long sewer trunk lines from Nightingale pump station to Buchannon Street Starkey Pump Station has not been explained or discussed with the public. It is opposed until some public consultation and presentation is made and alternatives presented. It appears that new flows from the Jeffersontown WTP removal project will shift millions of gallons of J-town wastewater into the South Fork watershed and this trunk line will have increased capacity to carry as it splits the new wastewater loading. It is expected that in a range of storms new SSOs will pop open along the length of the Hikes Lane trunk and up-pipe of the expanded Nightingale pump station, or that increased flows will trigger more overflows along the South Fork sewer shed. Because MSD has not explained the impact of these projects to the public, they are opposed. MSD has not calculated the benefit of green infrastructure alternatives by mandating rain capture to Class B property parking lots that would reduce the size and cost of these facilities.

Thank you for you for your consideration,

[redacted]

[redacted]

Attorney at Law
[redacted] Hepburn Avenue
Louisville, KY 40204

6.5 POST CONSTRUCTION COMPLIANCE MONITORING

MSD currently monitors a wide array of assets for performance including sewer lines, actuated gates, pump stations, and treatment plant components. A large amount of ambient, environmental data is also collected including stream flow, water quality, rainfall, biological, and habitat information. Collectively MSD uses this data to support many internal MSD activities such as:

- O&M event support
- Real Time Control (RTC) global and local operations
- Municipal Separate Storm Sewer System (MS4) permit activities and reporting
- Systematic and site-specific cause and effect evaluations
- Validation and recalibration of hydrologic, hydraulic, and water quality models
- The collection, identification, and prioritization of CSO and SSO control needs
- Informing the public about health concerns, customer behavior, and programmatic progress

MSD has the ability to review each data set parallel to one another to establish cause and effect relationships that assist in deciding the best course of action to address immediate operational, specific project, or programmatic needs.

Under the IOAP, the primary compliance assessment objectives will be to certify project completion to the selected overflow control level, both for CSOs and SSOs, as well as to determine if predicted water quality benefits are realized. As such, post construction compliance monitoring will support impact analysis and the validation of various objectives of IOAP projects initiatives, and the overall abatement plan.

To further develop and implement effective monitoring, MSD will continue to use methods that have proven effective with historical and current monitoring efforts. This experience is critical in determining the most accurate methods for characterizing capital project impacts and programmatic effectiveness. Compliance monitoring will capture both pre- and post-construction conditions. MSD will use this data to assess baseline conditions, existing sewer and stream conditions, and re-assess conditions periodically once IOAP projects and programs are underway.

Compliance monitoring will encompass project-specific monitoring, systematic sewer, pump station, and stream monitoring. Periodically, the collected data will be used to analyze and report upon environmental benefits through data trending and modeling. Much of this effort, as described below, is already underway and will be adjusted accordingly to enable assessment of the IOAP implementation. The objectives of compliance monitoring address new challenges, including small-scale overflow control projects such as green infrastructure, monitoring public behavior changes and implementing adaptive management.

This section discusses MSD's historical and current monitoring efforts, new IOAP compliance monitoring objectives, and the general monitoring approach for each major overflow abatement technology outlined within this plan. Gray and green infrastructure monitoring, sewer rehabilitation for inflow and infiltration (I/I) reduction, behavior change, data quality, modeling, and adaptive management are key elements of that equation. A flow chart outlining this Post Construction Compliance Monitoring process is shown in Figure 6.5.1 at the end of the Chapter.

6.5.1 Historical and Current Monitoring

MSD has been monitoring various environmental data sets for over 20 years. Comprehensive data have been collected for baseline conditions and event based evaluations for precipitation, sewer and stream samples, infrastructure, automated physiochemical analyses, and wet chemistry analyses on sewer and stream data, and in-depth biological indicator species and habitat analyses. Customer request and sewer overflow tracking has also been developed and implemented to identify problem areas and track system performance on an event basis.

Rain data has been collected by MSD continuously on a network of rain gauges across Louisville Metro since the early 1990s. In 2003, a network of radar rainfall data was added to fill in the gaps in physical distance between the rain gauges. Rain data are simultaneously evaluated with many of the other data sets to help determine the timing and impact of wet weather. A map of the rain gauges and radar grid is located in Figure 6.5.2.

Sewer flow meters have been in place in various locations in the MSD collection system since the early 1990s as well to assess baseline conditions, locate I/I, determine sewer overflow volumes, and assist sewer modeling efforts. The majority of the historical meters were temporary flow meters used for evaluation studies. MSD is installing additional permanent collection system flow monitors to assist future sewer model updates and calibrations. MSD has installed approximately 24 flow monitors in CSO overflow locations and will install additional meters by December 31, 2009.

All of the data from these new collection system and CSO meters will be available on telemetry and will be used to support the long-term trending and model calibration of the sewer system. A map of current and historical MSD flow monitoring sites (including pump stations and WQTCs) is displayed in Figure 6.5.3, and an example of how that data can be used with rain data is displayed in Figure 6.5.4.

In addition to the sewer flow meters, MSD has telemetered monitoring on over 2,000 assets in the collection system, the majority of which are at sewage pump stations – this number excludes internal monitoring for treatment center components. From pump run times, known pump capacities, and wet well levels, MSD can infer and model flow rates at many more locations than the ones that have actual flow meters. A map of the locations MSD has installed telemetered equipment is illustrated in Figure 6.5.5. Each point on the map represents an asset that has telemetered equipment installed and many assets have monitoring points stacked together. An example of how pump run time data and rain data can be used is displayed in Figure 6.5.6.

FIGURE 6.5.2 RAIN GAUGES AND RADAR RAINFALL GRID

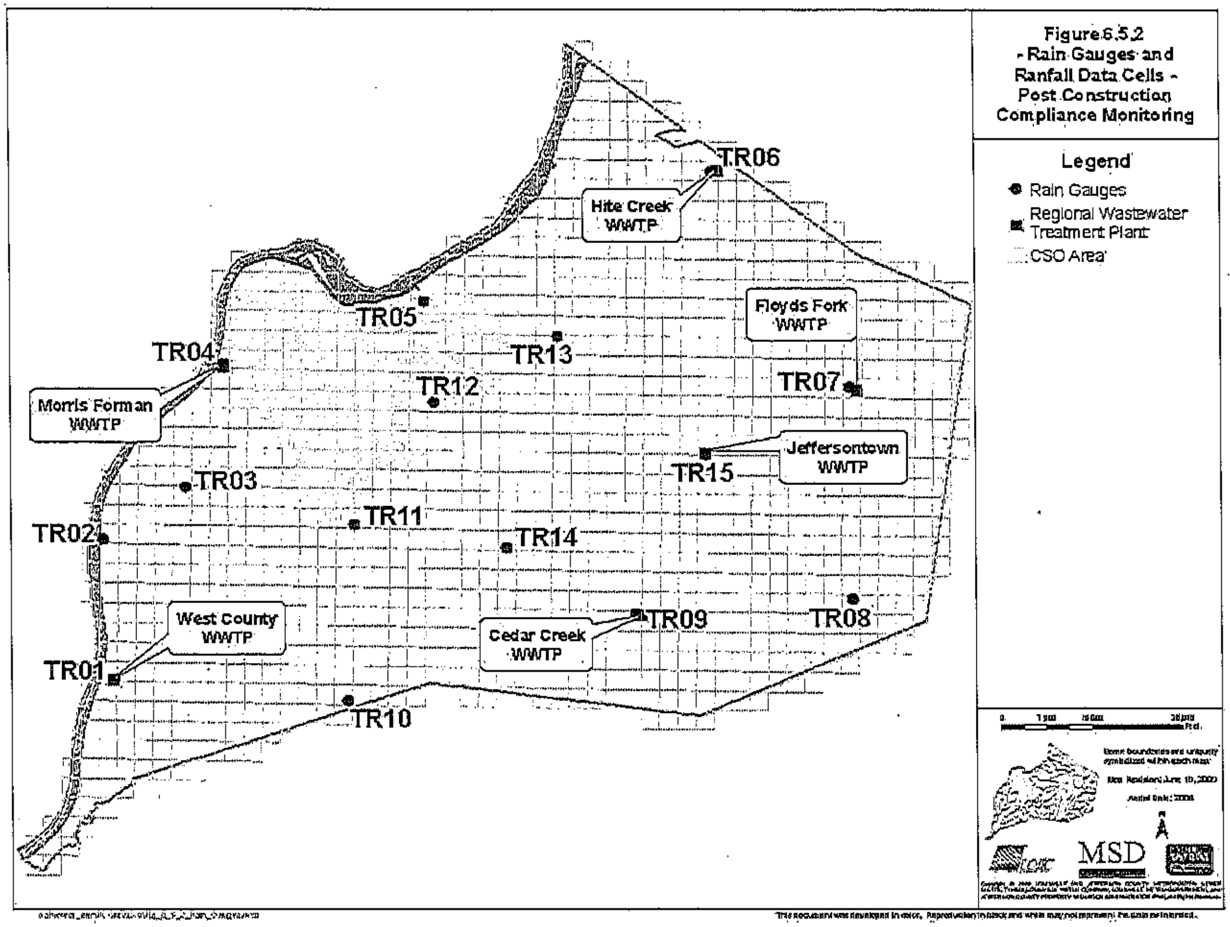


FIGURE 6.5.3 HISTORICAL FLOW METERS

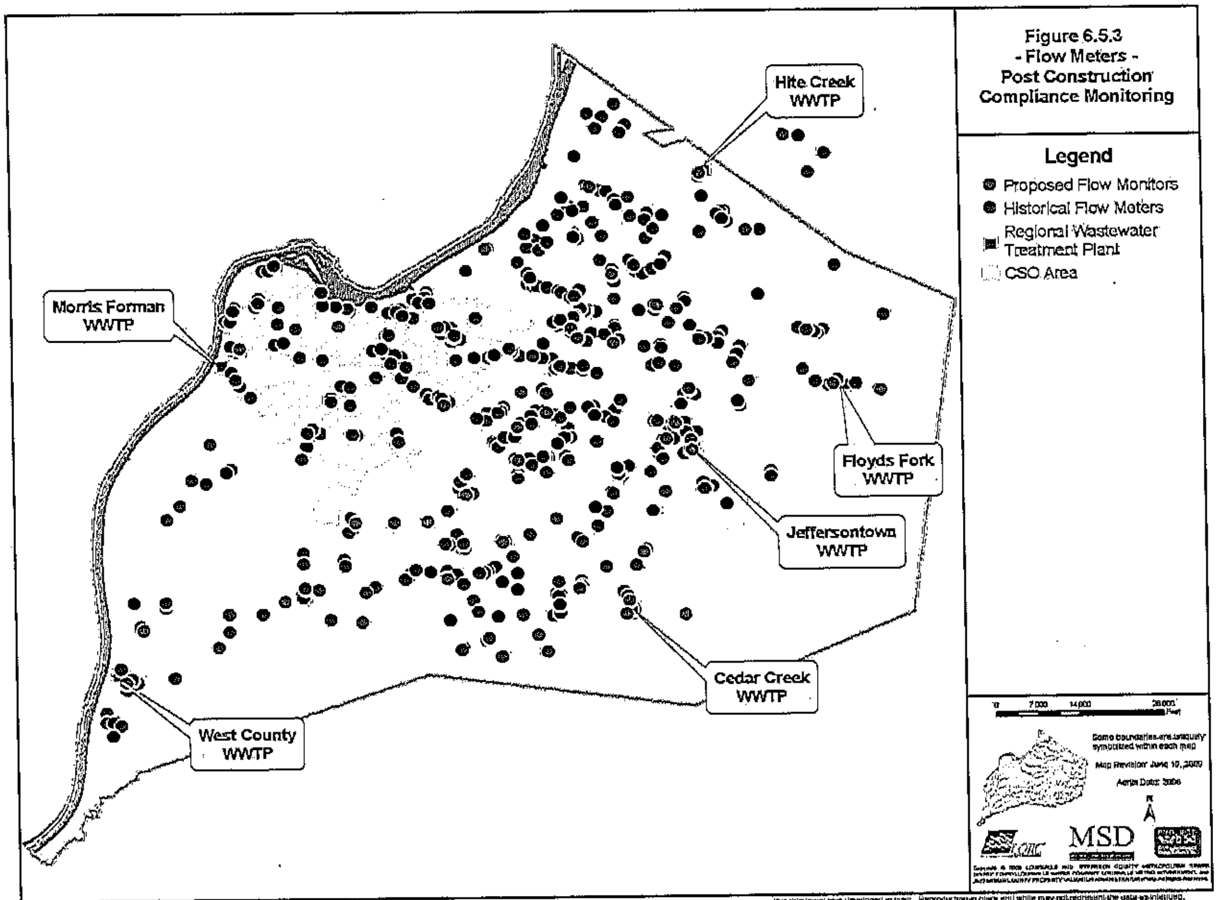


FIGURE 6.5.4 SEWER FLOW METER DATA WITH RAIN

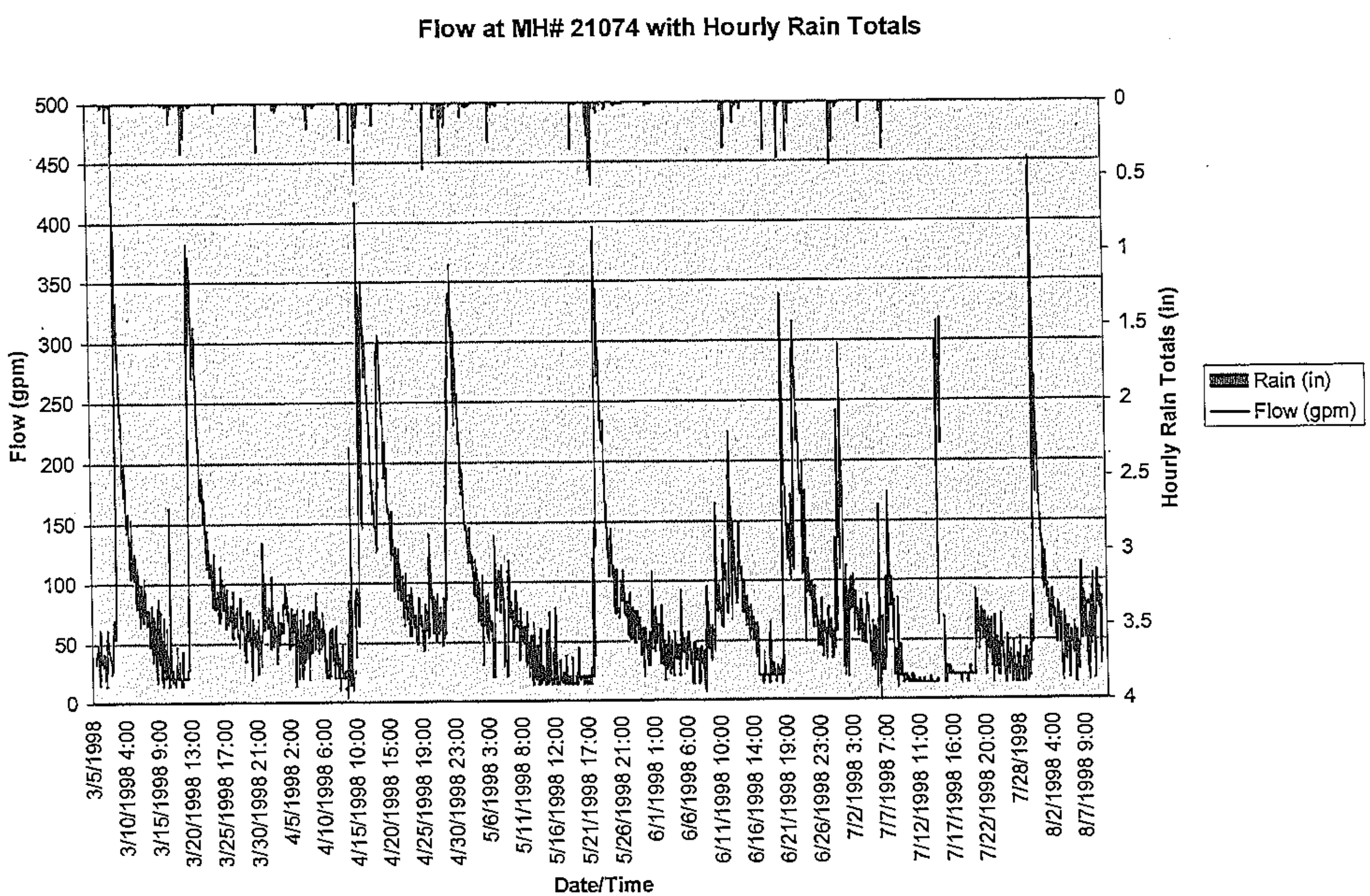


FIGURE 6.5.5 TELEMETERED MONITORING LOCATIONS

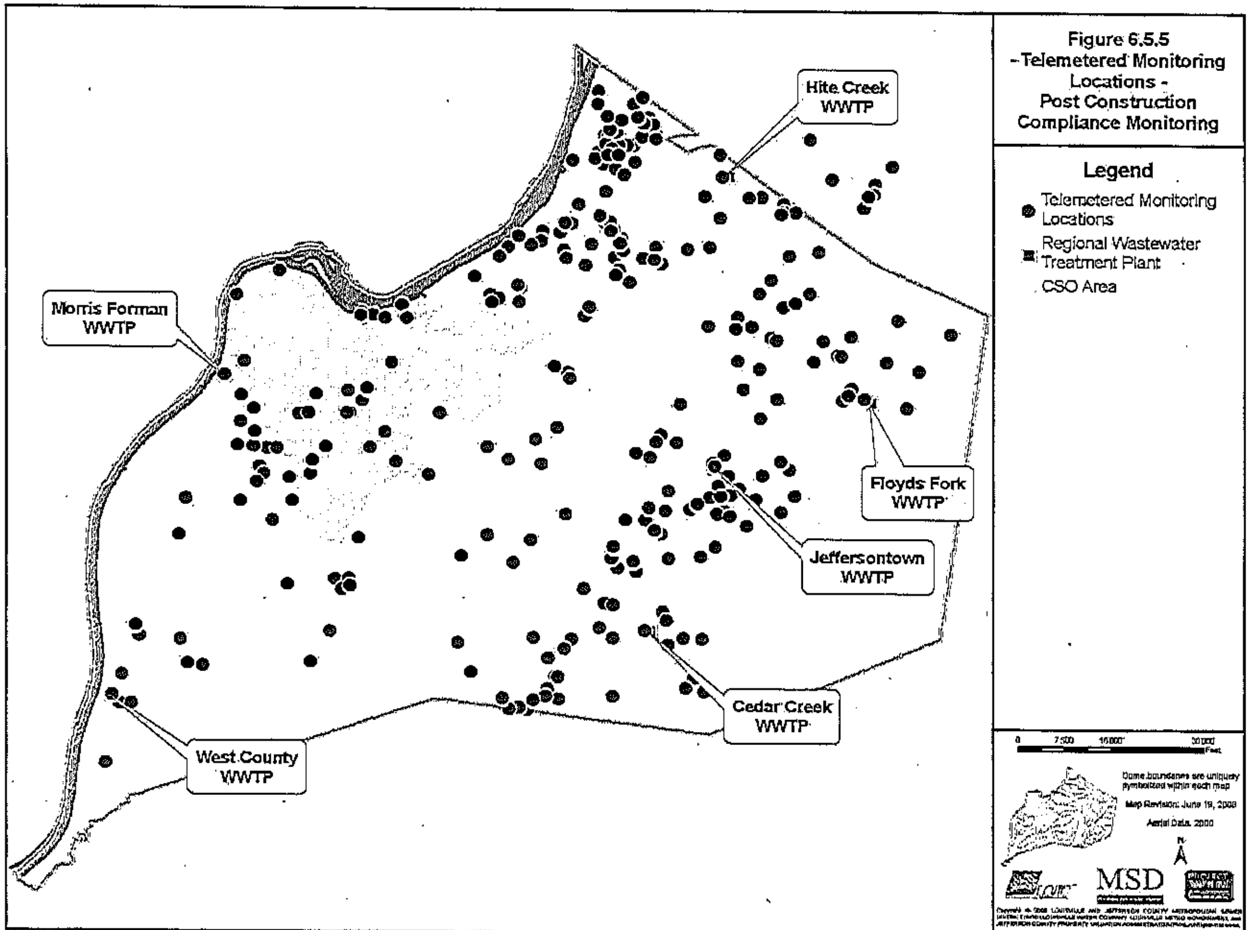
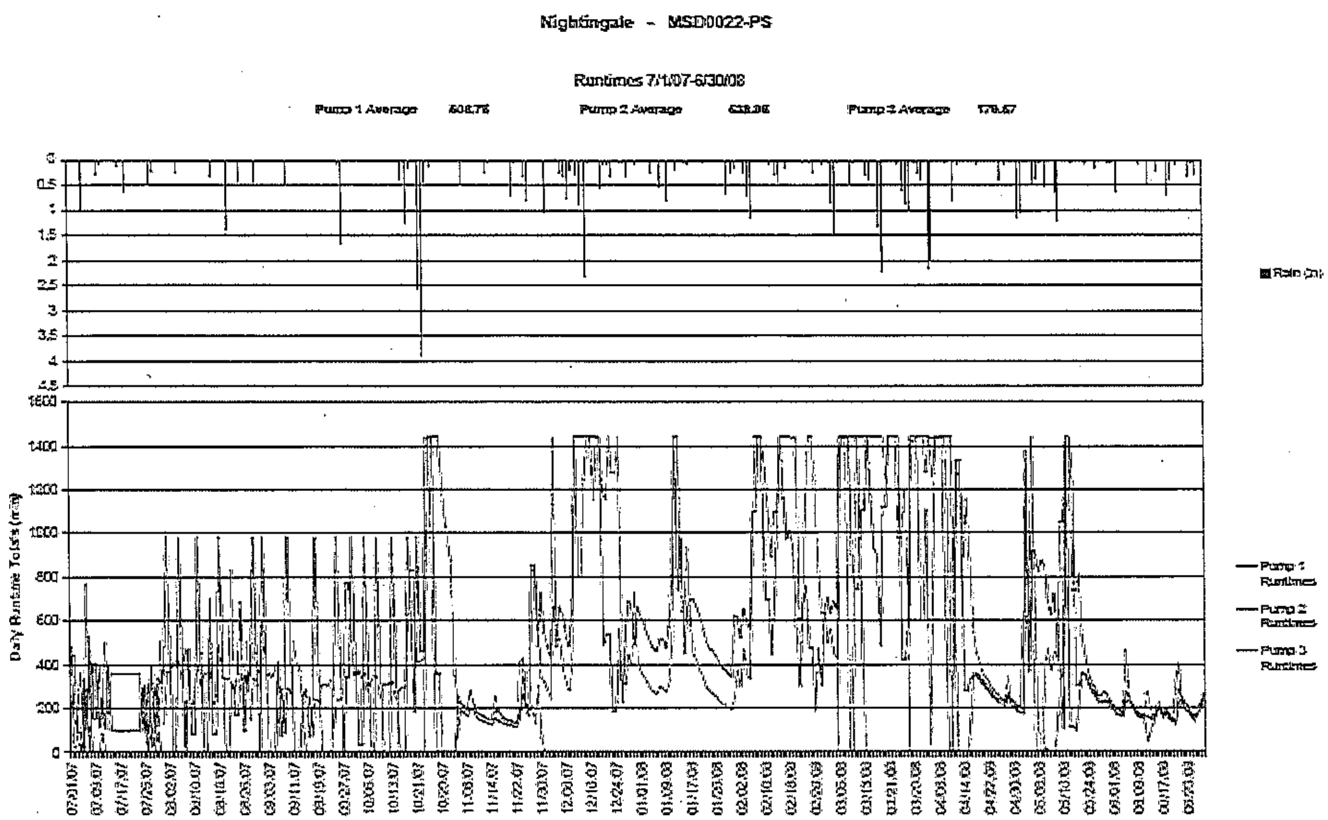


FIGURE 6.5.6 PUMP STATION RUN TIMES AND RAIN AT NIGHTINGALE PUMP STATION



United States Geological Survey (USGS) stream flow gauges have been in place for many years at MSD's stream long-term monitoring network (LTMN) shown in Figure 6.5.7, and those data are an important part of tracking wet weather flow and calculating pollutant loadings. The data are transmitted remotely and available in real-time on the USGS web site (http://waterdata.usgs.gov/ky/nwis/rt) and on MSD's intranet.

The equipment housing and communications ports for the stream flow meters are shared with MSD's automated stream water quality meters called sondes. The sondes collect dissolved oxygen, pH, temperature, and conductivity readings every 15-minutes, which enables MSD to see diurnal patterns in those data series as well as longer-term trends. Since the year 2000, MSD has maintained 28 sonde sites, in and around Louisville Metro. Data from these sondes is also available at the site referenced above and on MSD's intranet. Twenty-six of those sonde sites also contain stream flow gauges. The graph in Figure 6.5.8 gives an example of healthy dissolved oxygen, pH, conductivity, and temperature readings in a local stream. The downward spikes in the conductivity directly correlate to small rain events that occurred during that time period.

Surface water and wastewater samples are collected on stream and sewer locations respectively and delivered to the laboratory for analysis on a routine basis and for special projects. The laboratory analyzes the samples for a variety of pollutants including bacteria, conventional pollutants, nutrients, and metals. A graph displaying fecal coliform samples taken during a wet weather event at one location is presented in Figure 6.5.9.

Biological samples are collected at the LTMN to assess long-term stream health. Samples are collected for fish, macroinvertebrates, and algae because the number and species of each is an important indicator of stream health, and the sets are interrelated. Habitat data is also collected at each site to indicate what type of environment is available to the different organisms. Figure 6.5.10 depicts how the fish data is gathered.

The number and species of each organism are important indicators of stream health. The raw data have been compiled into an objective metric called the Index of Biotic Integrity. That system provides a consistent framework for converting detailed species lists and counts into simplified numeric evaluations against standards that rate a stream as "Excellent", "Good", "Fair", etc. The standard is based on knowing the tolerance of each species of organism to different types of environmental pollution. Finding sensitive and more diverse species may be an indication of better water quality, and finding less diverse and highly tolerant species may indicate poor water quality.

Figure 6.5.11 below shows an example of Fish Index of Biotic Integrity scores trended over time at two locations. In this graph, Cedar Creek in Bullitt County shows a similar score in three different evaluation years with each score falling in the "Fair" range. Chenoweth Run at Ruckriegel Parkway showed a similar score in three different evaluation years with each score falling in the "Poor" range.

FIGURE 6.5.7 STREAM LONG TERM MONITORING NETWORK

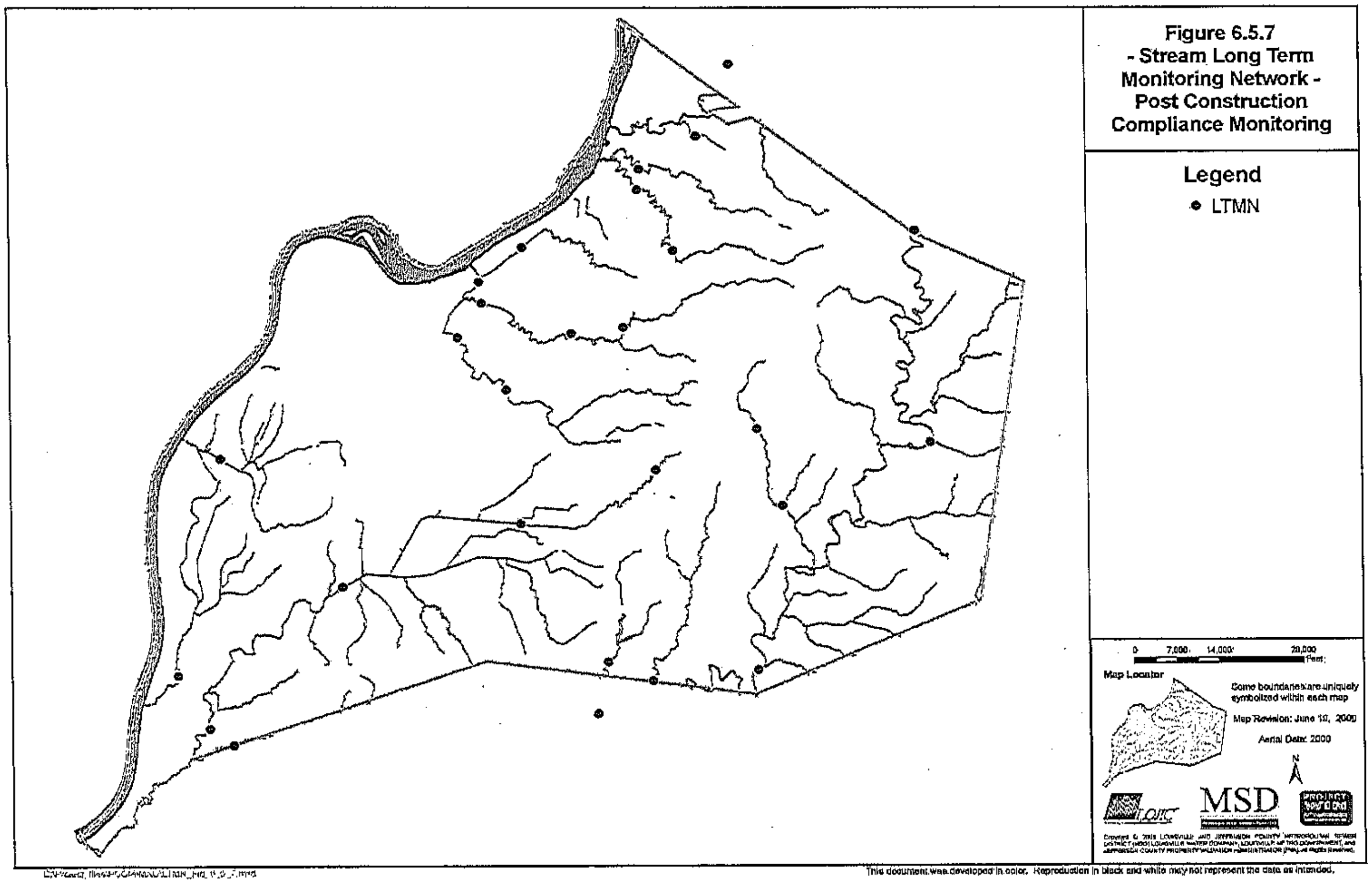


FIGURE 6.5.8 SONDE DATA FROM SAMPLING LOCATION EMIMI009

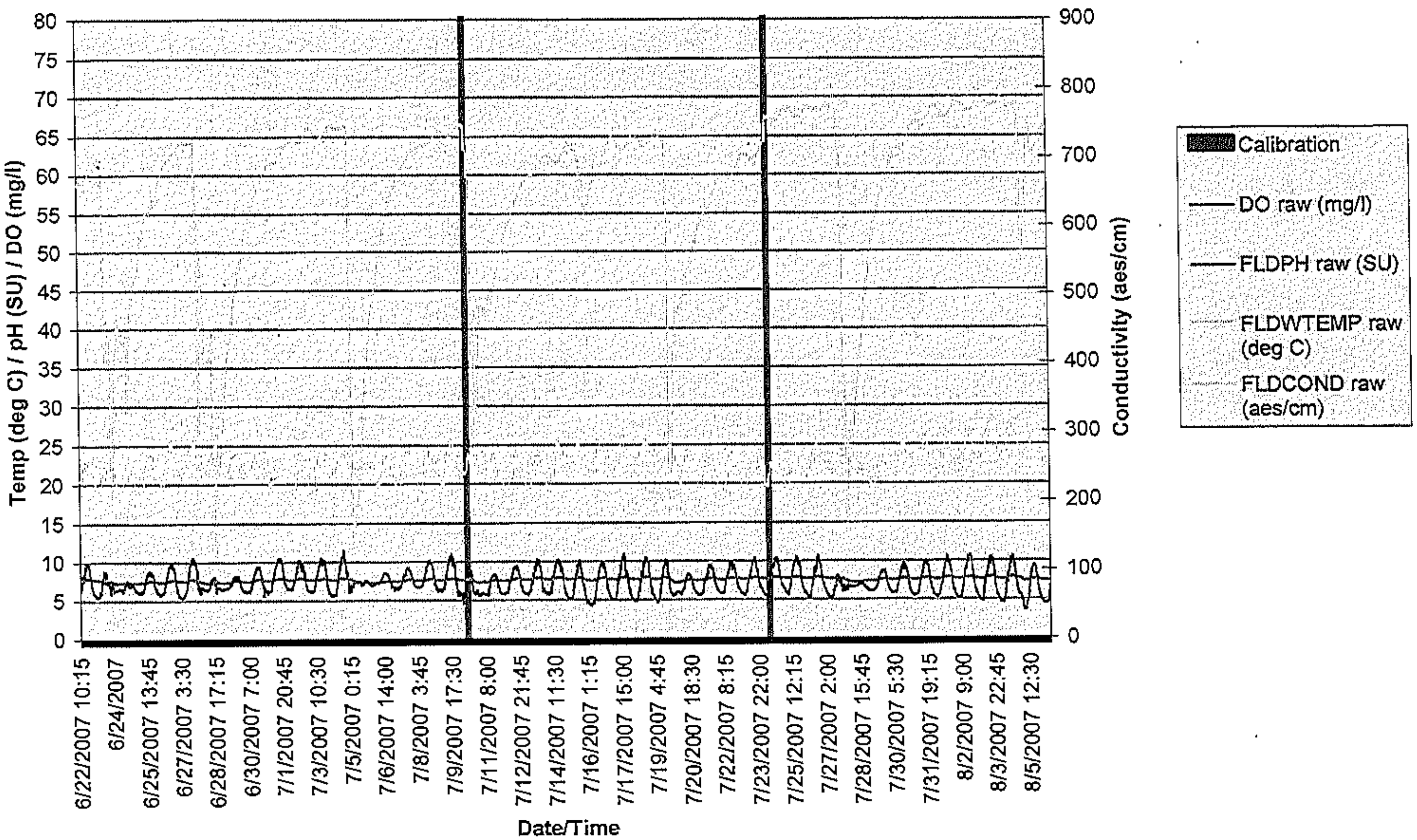


FIGURE 6.5.9 FECAL COLIFORM SAMPLES AT SAMPLING LOCATION EMUMU007 WITH RAIN

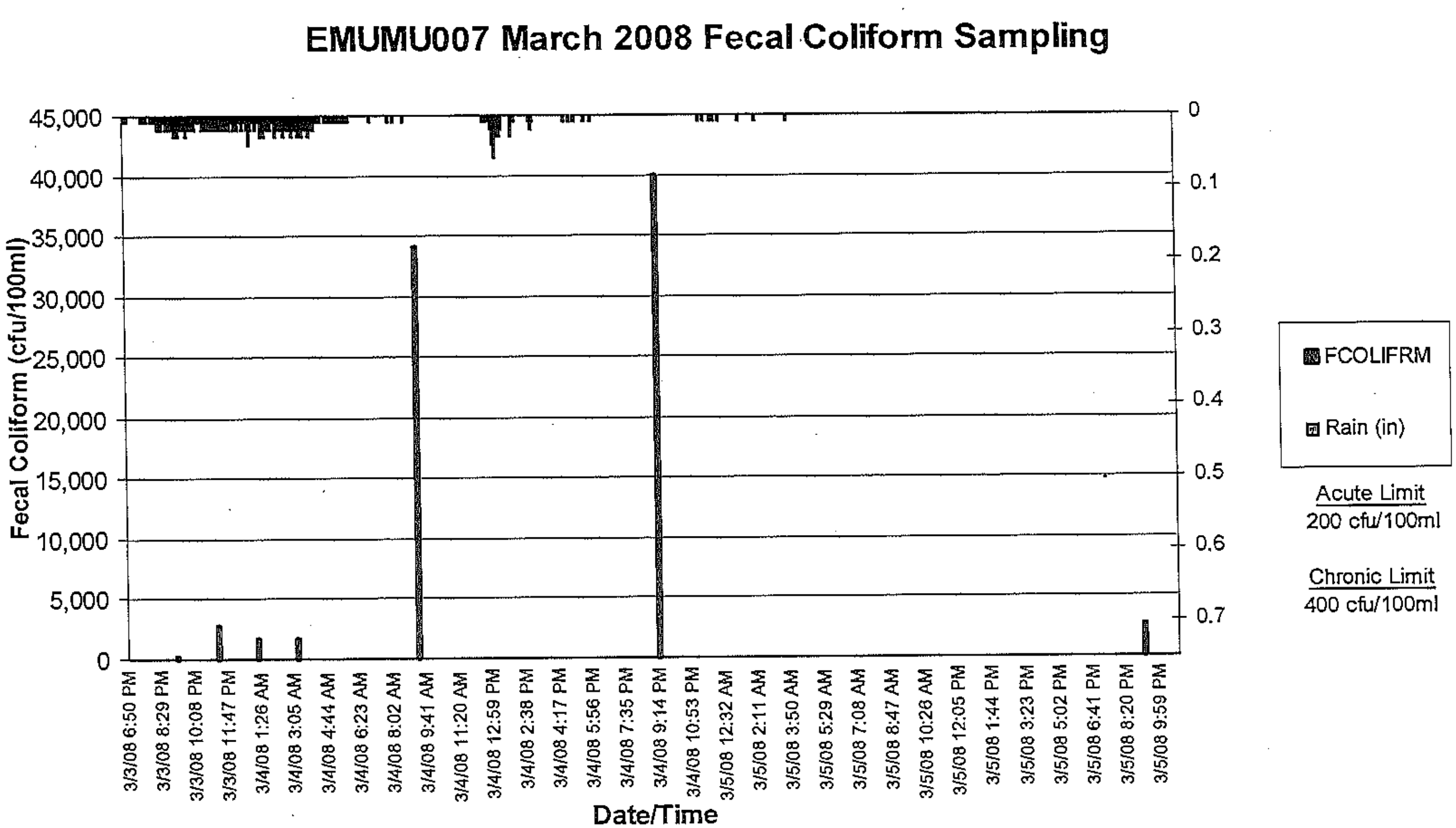
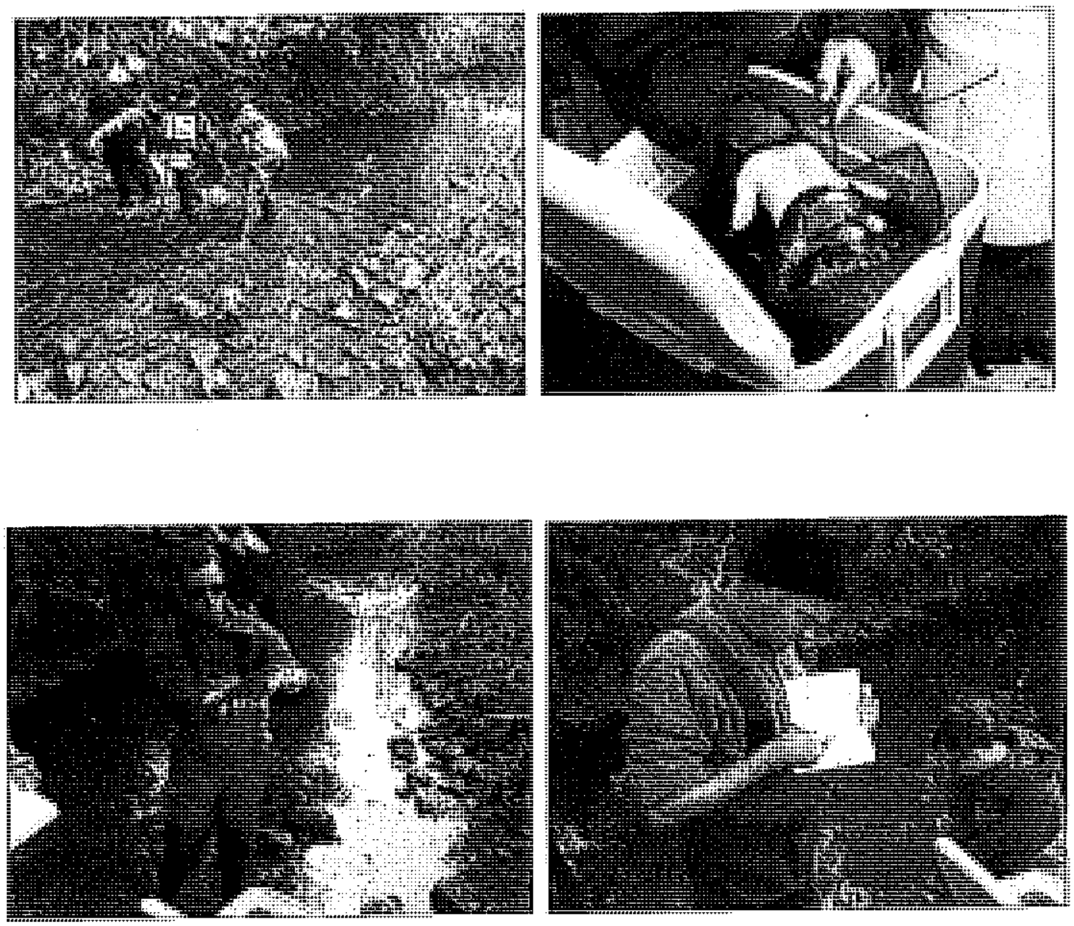


FIGURE 6.5.10 FISH SAMPLING



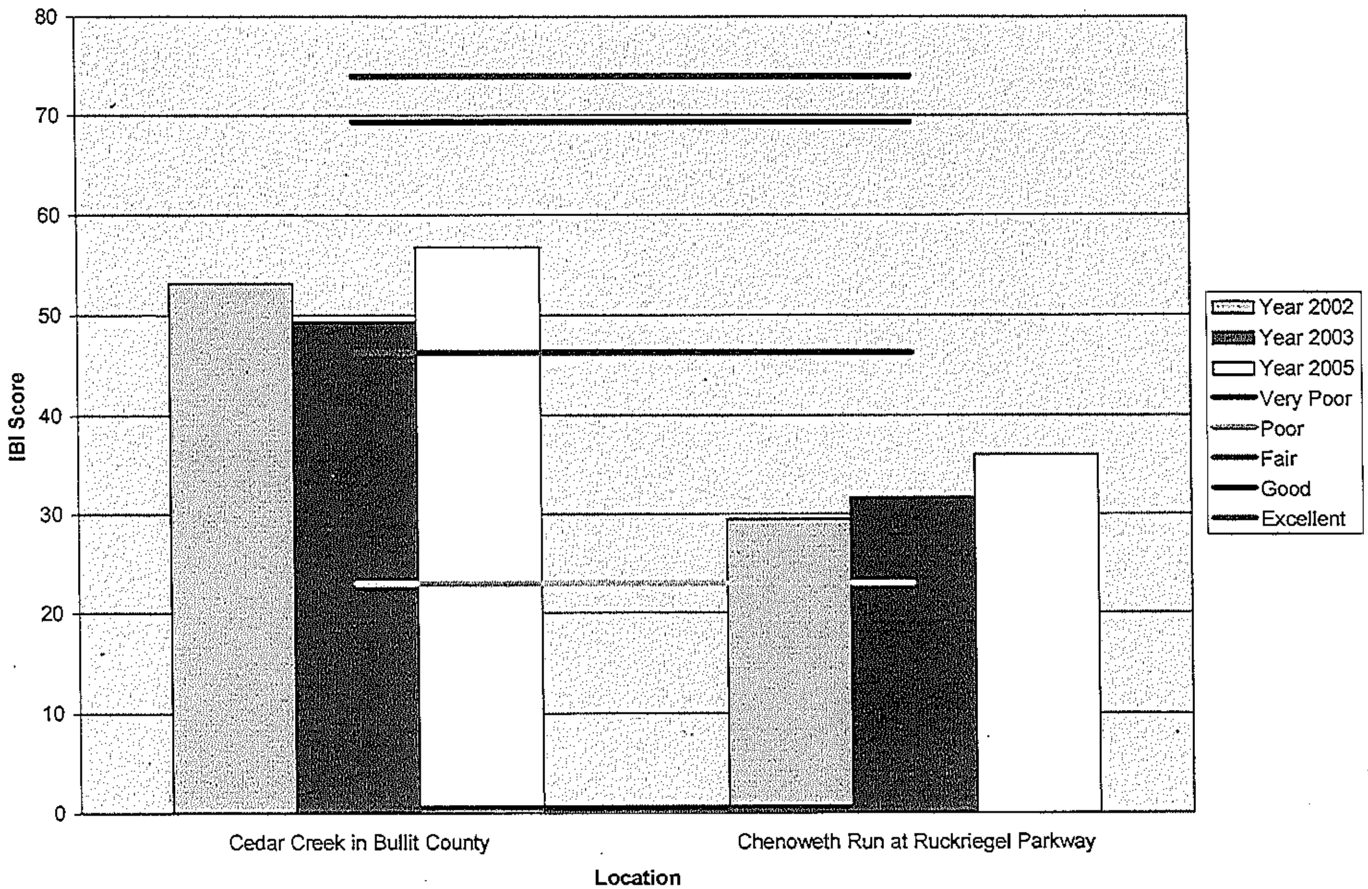
Top Left – Stream Technicians use Electrofishing techniques to collect fish over a designated stream reach.

Top Right – They transfer all fish to a cooler for temporary holding.

Bottom Left – Species are identified for each individual fish

Bottom Right – Results are documented for number of each individual species caught. These data are turned into a measure of stream quality.

FIGURE 6.5.11 FISH INDEX OF BIOTIC INTEGRITY (IBI) 2002 - 2005 AT 2 LOCATIONS



6.5.2 IOAP Compliance Monitoring Objectives

To meet local, state, and federal objectives that have been set forth through the overflow abatement planning process, MSD will continue the existing activities described above and implement new monitoring and modeling activities for various components of the plan. A Gantt chart displaying the current and future monitoring and modeling efforts is outlined in Figure 6.5.12 at the end of the chapter. The WWT Stakeholder Group clearly defined a set of values they determined were important to MSD and the community. The values were used to determine the projects and programs selected within this plan and MSD's Post-Construction Compliance Program will assist in demonstrating the level of conformance with the intent of this plan.

Monitoring objectives are to assess the individual performance of projects as they are completed, as well as the collective, improved system performance and subsequent water quality impacts of the IOAP. Monitoring will determine the efficacy of the system, compliance with water quality standards, and help evaluate if there is a need for additional projects or programs to meet water quality compliance. Finally, area-wide programmatic elements (green infrastructure, I/I reduction) and collective project impacts of the overflow abatement plan must demonstrate their effectiveness through hydraulic and water quality modeling. These models will be recalibrated approximately every five years with collected rain data, flow monitoring, stream sampling and other assessment data. The modeled elements will include green infrastructure projects such as downspout disconnection, green roofs, and pervious pavements focused on the combined sewer area along with I/I reduction, sump pump disconnection and illicit connection removal in the separate sanitary area. Monitoring efforts specific for assessing IOAP compliance are discussed in the following subsections.

6.5.3 IOAP Compliance Monitoring Components

The primary IOAP components to be assessed through monitoring and modeling are:

- Gray Infrastructure – wet weather conveyance, storage, and treatment
- Green Infrastructure – impervious area disconnection through downspout, pervious pavement, & green roof programs
- I/I reduction and Private Property Program – targeted sewer rehabilitation areas to reduce flows from inflow and infiltration and illicit property connections
- Behavior Change – effects of the public information and outreach program

To assess these components, several activities, beyond the collection of data, will be crucial throughout the process.

- Data Quality Assurance – assessing data to be used in hydraulic and water quality model calibration to be sure that it is representative and accurate
- Systematic Performance Assessment - Utilizing environmental and flow meter data sets to update the sewer and water quality models to assess system overflow reduction and overall plan effectiveness
- Adaptive Management – managing, scheduling, and adjusting the programs and projects which are required to fulfill the requirements set forth in this document

Consistent application of these activities will allow MSD to effectively assess compliance with IOAP objectives. Monitoring programs to assess gray infrastructure performance, such as storage basins and pipes, are well documented and understood. Green infrastructure, along with I/I reduction and a private property program for removing illicit connections, presents new ways of thinking about wet weather management; however, in concept, monitoring compliance and effectiveness are relatively similar to gray solutions. Due to the smaller and dispersed nature of these overflow controls, demonstration or case study sites will be used to establish their effectiveness. Once established, these effects will support the expanded use of similar controls, implemented on a larger area.

Community-wide behavior change is another important aspect that needs to be monitored. Cooperation and understanding from the community and other partners are key to long-term IOAP success. As with practices such as recycling and conservation, dramatic long-term impacts can be obtained by raising public awareness of an issue, such as water quality, and how adjusting individual behavior can have an effect.

Finally, reporting on system performance concerning overflow mitigation will be accomplished utilizing sewer and water quality models that will be updated annually and calibrated every five years, with the environmental data sets that MSD collects. As the IOAP projects and programs are implemented over time, the existing conditions for the models will be adjusted, and the typical year rainfall and design storms will be simulated to demonstrate compliance with plan targets.

6.5.3.1 Gray Infrastructure – Wet Weather Conveyance and Storage

Gray solutions have been the standard for wet weather management for many years. Even with the movement in recent years towards using more green solutions, there is a still a need for gray solutions. Large areas of impervious surfaces subject to heavy rain events are often effectively dealt with through the use of sophisticated gray infrastructure. Monitoring the success of gray infrastructure consists primarily of flow monitoring, water quality sampling, and assessments of storage and conveyance. The results from those monitoring efforts, along with carefully studied green infrastructure test sites, will allow MSD to recalibrate and update hydraulic and water quality models, which directly impact the sizing, expectations and implementation of gray solutions and projects.

Flow Monitoring

Flow monitoring is an important tool in determining the success of gray solutions. MSD will utilize flow monitoring data to verify and recalibrate flow projections, calculated using hydraulic models, for new and rehabilitated sewer lines, manholes, and pump stations. Current and future monitoring efforts will encompass CSS flow, storage facilities, recreational contact sites, satellite community flow (where applicable), separate sanitary flow, I/I, pump stations, water quality treatment centers, CSOs and other contributing factors to accurate modeling.

MSD currently has permanent sewer flow meters in place throughout the county and is installing additional long-term sewer flow meters. These meters will be placed in suitable locations to provide data for model recalibration, tracking watershed goals, and tracking CSO control and SSO elimination efforts. Temporary monitors will be placed in areas affected by capital construction, green infrastructure, and sewer rehabilitation. Temporary flow monitor data will supplement permanent flow meter data to express a more accurate portrayal of the effectiveness of the projects.

There are currently sewer flow meters installed in of the majority of the CSOs that were determined, by average annual overflow volume (AAOV) calculations from modeling, to overflow more than ten million gallons (MG) per year. Recent modifications to the combined sewer model have established that additional CSOs have an AAOV of ten MG per year or more. MSD will place flow monitors on those CSOs by December 31, 2009. MSD will install peak level indicators at or near CSOs, if the physical configuration makes a specific site infeasible to meter. These inspections attempt to determine whether the CSO overflowed, associate a cause and estimate an approximate volume. A list of the currently monitored CSOs and CSOs and the ones that will be monitored by December 31, 2009, can be seen in Table 6.5.1.

TABLE 6.5.1

CURRENT AND FUTURE METERED CSOS

CSO ID	Currently Monitored	AAOV (mg/yr)
CSO015	Southwestern PS	845.75
CSO019	34th Street PS	305.4
CSO088	Mellwood Ave Int	0.58
CSO105	Western Outfall @ Broadway	21.46
CSO108	Reg No 1 - Newburg	36.07
CSO110	Reg No 3 - Goss Ave	30.39
CSO117	Reg No 11 - Dry Run	94.13
CSO118	Reg No 15 - E. Broadway	100.17
CSO125	Reg No 24 - Grinstead Dr	48.63
CSO127	Etley Avenue	4.63
CSO132	Reg No 35 - Brownsboro	149.36
CSO140	Locust Street	17.01
CSO146	Sneads Branch Diversion	52.57
CSO151	Reg No 5 - Castlewood	86.01
CSO152	Reg No 7 - Southeastern	76.34
CSO166	Beals Branch San Div	10.13
CSO182	Part of Sneads Branch Relief	N/A
CSO189	Northwestern San Div	175.86
CSO190	Seventeenth St San Div	36.19
CSO191	Algonquin Pkwy San Div	40.26
CSO206	Cherokee Park @ Spring Dr	19.91
CSO210	45th Street - Greenwood	197.29
CSO211	Main Diversion Structure	377.61
CSO ID	**Monitored by 12/31/09**	**AAOV (mg/yr)**
CSO016	Miles Park Bypass	29.94
CSO018	Nightingale PS	44.3
CSO023	ORI @ 4th St PS	76.78
CSO050	12th St	39.77
CSO055	6th St	19.17
CSO058	Preston St Overflow Weir	124.16
CSO084	Brent St & BGC	17.94
CSO097	Cantonment Siphon No 2	16.07
CSO119	Brent Street Sewer	12.51
CSO121	Reg No 18 - Green St	11.23
CSO149	Dry Run Diversion	56.78
CSO153	Cooper Street	15.66
SBR	Sneads Branch Relief*	12.14

* Includes CSOs 142, 174, 180, 182, 183, 184, 185, 186, 187, 188, & 205

Water Quality Sampling

Automated water quality measurements are recorded in 15-minute intervals at the 28 LTMN sites in Jefferson County. MSD collects bacteria samples at each LTMN location five times per month during the recreational contact season. The data is used to determine compliance with water quality standards such as daily averages, maximums, minimums, and 30-day geometric means. Quarterly samples are also taken at these sites to gather more in depth readings of conventional pollutants, nutrients, and metals.

MSD will conduct wet weather water quality sampling at the LTMN sites approximately three times every five years. Rain events chosen for sampling will have a predicted depth of 0.5 inches or more. CSOs are normally active in a rainfall of this size and the data enables a water quality analysis of impacts on local streams to be performed. Samples for fecal coliform, suspended solids, BOD, nitrogen, phosphorus, and typical sonde readings will be taken over a 48-hour period, capturing the readings before, during, and after the rain event to demonstrate pollutant loading in the stream during wet weather.

The results for the water quality testing currently taking place at treatment centers is reported monthly in the Discharge Monitoring Reports (DMR) in accordance with the respective KPDES permits. With the addition of new wet weather treatment processes and treatment facilities, MSD will monitor the quality of effluent from these new facilities, especially at the new high-rate treatment facility at the Paddy's Run Flood Pump Station and the modified secondary treatment process at the Derek R. Guthrie WQTC (formerly known as the West County Wastewater Treatment Plant).

Testing at the Derek R. Guthrie WQTC will follow guidelines and agreements per the specifications in Section 3 of the Interim SSDP. Testing of effluent at the wet weather treatment facilities proposed for the Paddy's Run Flood Pump Station area will follow similar protocols, adjusted to account for the intermittent nature of the discharge, and the different treatment objectives. These tests will help to determine whether MSD projects have been effective in reducing pollutant loads being discharged to streams and the Ohio River. Water quality data trended over several years will support more accurately calibrated water quality models.

Continuing long-term monitoring at the LTMN sites, wet weather sampling, recreational contact site sampling, and treatment plant sampling will be required for specific reporting as well as long-term ambient monitoring. Ambient monitoring is necessary for assessing compliance with water quality standards over time in Louisville Metro. In addition, long-term monitoring provides MSD with a broad look at the effects of new construction, implemented projects and programs, and public participation. A complete schedule of flow monitoring and water quality monitoring events can be found in Appendix 6.5.1.

6.5.3.2 Gray Infrastructure – Wet Weather Treatment

In addition to using gray infrastructure for wet weather storage and conveyance, MSD also proposes to expand the current wet weather treatment capacity. The IOAP proposes the construction of a wet weather expansion of the Derek R. Guthrie WQTC and a retention treatment basin system near the Paddy's Run Flood Pump Station.

Derek R Guthrie WQTC Flow Equalization and Treatment Project

MSD is increasing its conveyance capacity and wet weather storage in targeted areas to eliminate SSOs. Part of the additional wet weather flow captured will be conveyed to the Derek R. Guthrie WQTC that currently has a current peak hydraulic design capacity of 96 mgd. In order for the Derek R. Guthrie WQTC to handle the additional wet weather flow, it is necessary to expand the wet weather treatment capacity of the plant by an additional 100 mgd. Process changes are expected to increase the capacity of the existing facilities to 100 mgd also, for a total wet weather peak flow capacity of 200 mgd with all units in service. The Post Construction Compliance Monitoring Plan will incorporate the following four elements: equipment testing, field verification of the hydraulic model, field verification of the process model, report on one-year operations including a certification of expansion. These elements are described in detail below.

Equipment Testing

Field testing of the critical equipment at the Derek R. Guthrie WQTC will be conducted to ensure that actual equipment and system performance meets or exceeds design requirements. The critical components to be tested as part of the Derek R. Guthrie WQTC expansion include influent pumps, aeration blowers, bar screens, grit collectors, and clarifiers.

Each influent pump will undergo the following field tests:

- Alignment - Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
- Vibration Test - Test with units installed under normal and peak operational loads to ensure minimal vibration.
- Flow Output - Measured by plant instrumentation and storage volumes.
- Operating Temperatures - Monitor bearings on pump and motor for abnormally high temperatures.

Each blower will undergo the following field tests:

- Alignment - Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
- Vibration Test - Test with units installed under normal and peak operational loads to ensure minimal vibration.
- Performance - Measured by plant instrumentation and manufacturer's equipment curves.
- Operating Temperatures - Monitor bearings on blower and motor for abnormally high temperatures.
- Voltage and Amperage - Measured for minimum, average, and maximum design conditions.

Each bar screen will undergo the following field tests:

- Alignment - Check complete assemblies for operational alignment to ensure moving parts do not rub stationary parts and equipment tracks straight through full cycle.
- Performance - Verify raking capacity and smooth operation.

Each grit collector will undergo the following field tests:

- Alignment - Test complete assemblies for proper rotation and operational alignment to ensure moving parts do not rub stationary parts and equipment tracks straight through rotation.
- Performance - Verify raking capacity and smooth operation.

Each clarifier will undergo the following field tests:

- Alignment - Test complete assemblies for proper rotation and operational alignment to ensure moving parts do not rub stationary parts and equipment tracks straight through rotation.
- Performance - Verify raking capacity and smooth operation.

Manufacturer representation will accompany all equipment testing.

Hydraulic Model Field Verification

The Derek R. Guthrie WQTC expansion is designed to provide a total peak hydraulic flow of 200 mgd. This design peak hydraulic flow capacity will be verified at the completion of the expansion project. Verification of an actual 200 mgd flow is difficult due to the infrequent nature of heavy rain events and the inherent challenges of surveying during these times. Therefore, this flow will be simulated by removing from service a specific number of processing tanks while adjusting flow to a predetermined amount. This simulation procedure is detailed in Table 6.5.2, which shows the specific number of units in service at each flow rate (highlighted cells show which process is being tested).

Currently, the average daily flow (ADF) at Derek R. Guthrie WQTC is approximately 25 mgd. The higher flow rates required for testing will be achieved by temporarily storing influent in the onsite retention basin (approximately 17 MG active storage) and then releasing it into the WQTC head works.

TABLE 6.5.2

DEREK R. GUTHRIE WQTC 200 MGD SIMULATION

(UNITS IN SERVICE DURING SELECTED FLOWS)

Processing Unit	Total # of Units	Wastewater Flow Per Unit at 200 mgd[1]	50 mgd	67 mgd	100 mgd
Grit Basins	4	50	1	2	2
Stabilization Basins	2	43[2]	2	2	2
Contact Basins	3	67	1	1	2
Secondary Clarifiers	12	16.7	3	4	6
Disinfection Basins	4	50	1	2	2

[1] Assumes all units in service
[2] RAS flow rate at 200 mgd influent rate
Note: highlighted cells show which process is being tested

Additionally, the hydraulic model developed during the treatment plant design will be calibrated based on the results of the surveyed water surface elevations taken at various flow rates. Once calibrated, the modeled hydraulic capacity at 200 mgd will be confirmed.

Process Model Field Verification

The Derek R. Guthrie WQTC will be field tested to verify that each of the unit processes are functioning as designed. This will be accomplished by analyzing samples taken at key locations throughout the plant and comparing the measured data with process design data. The wastewater sampling parameters are shown in Table 6.5.3 and the sampling locations shown on Figure 6.5.13.

Simulating biological treatment design conditions for biochemical oxygen demand$_5$ (BOD), total suspended solids (TSS), and flow rate will be extremely difficult. Treatment performance will be plotted against influent conditions to trend performance to the design conditions.

TABLE 6.5.3

DEREK R. GUTHRIE WQTC SAMPLING PARAMETERS

Sample Point	TSS	BOD_5	pH	NH_3	DO	Fecal Coli	Chlorine Residual	SVI	MLSS	MLVSS	Blanket Depth
A – Influent Line	X	X	X	X							
B – Contact Basin					X			X	X	X	
C – Secondary Clarifier											X
D – Effluent Line	X	X	X	X	X	X	X				

BOD - biochemical oxygen demand; DO – dissolved oxygen, NH_3 – ammonia ; SVI- Sludge Volume Index, MLSS – Mixed Liquor Suspended Solids; MLVSS – Mixed Liquor Volatile Suspended Solids

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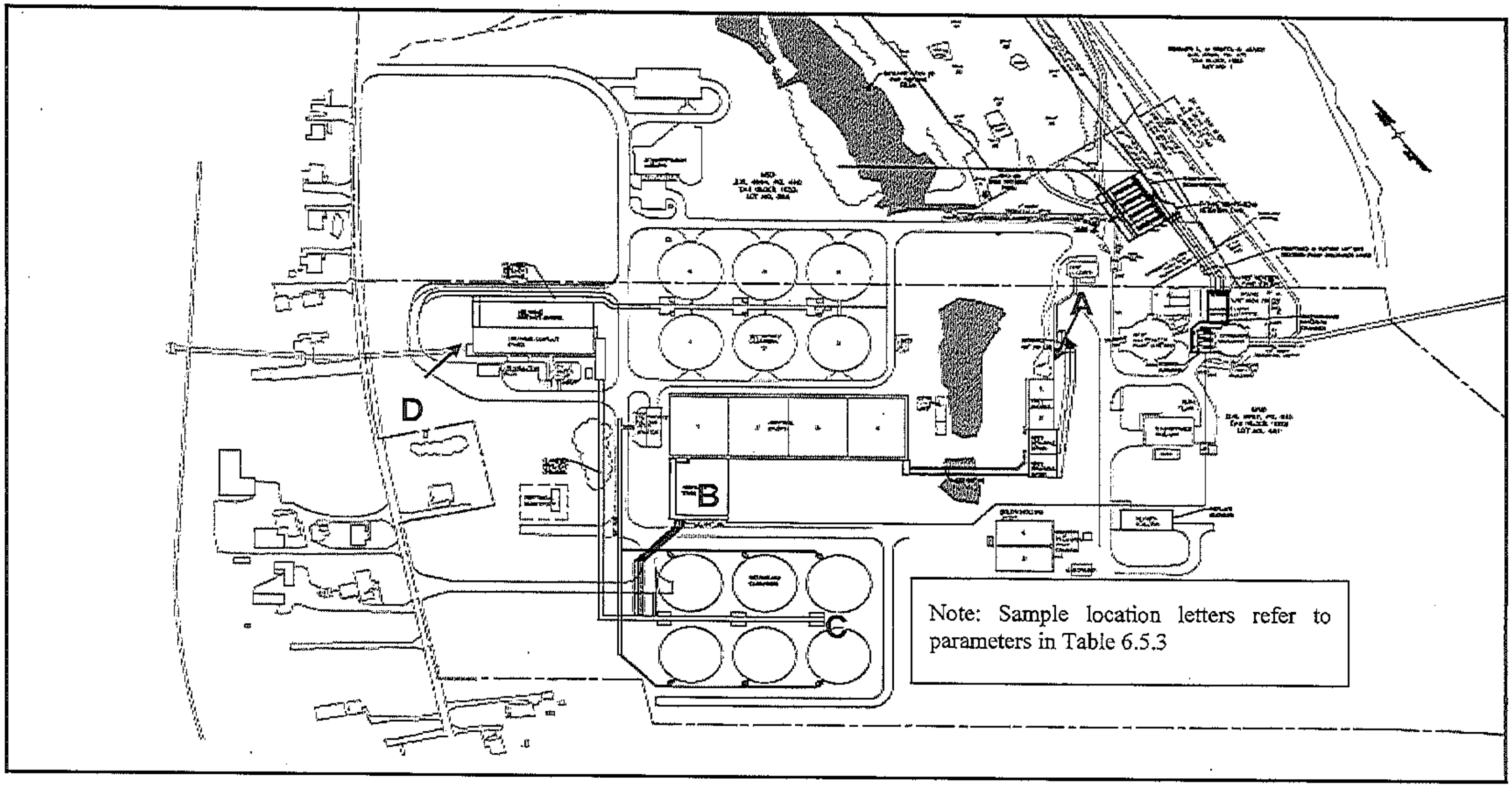
Twelve months of sampling data (beginning one month after startup) will be analyzed to verify that the secondary treatment system meets or exceeds the design intent, and that both dry weather and wet weather performance is in accordance with current permitted effluent secondary standards. If the plant is functioning as intended, then verification of the operational performance will be documented in a report. If actual performance does not meet the design intent, remedial actions will be recommended in the report to bring the process into compliance.

FIGURE 6.5.13 DEREK R. GUTHRIE WQTC SAMPLING LOCATIONS



Retention Treatment Basin

In a continuing effort to reduce CSOs, it is necessary to construct a basin to provide short-term storage and "equivalent primary treatment". During wet weather events, the basin will provide retention until its maximum storage capacity has been reached. If the maximum capacity is not reached during the event, the wastewater will be pumped from the basin to the Morris Forman WQTC for treatment. If the maximum capacity of the basin is exceeded during the event, it will serve as an equivalent primary treatment system, providing sediment removal, disinfection, and removal of disinfection residuals as per discharge permit requirements. The Post Construction Compliance Monitoring Plan for the Retention Treatment Basin will incorporate the following three elements: equipment testing, field verification of the process model, report on one-year operations including a certification of expansion. These elements are described in detail below. Note that field verification of a hydraulic model (planned for the Derek R. Guthrie WQTC compliance monitoring plan) is not required for the retention treatment basin due to the simplicity of the hydraulics through this basin.

Equipment Testing

Field testing of the critical equipment will be conducted to ensure that design performance is being realized. The critical component of the retention treatment basin is the chemical feed system. This system will be tested to verify that its capacity meets or exceeds design requirements. Manufacturer representation will accompany all equipment testing.

Process Model Field Verification

In accordance with EPA requirements outlined in its CSO Control Policy, any "combined sewer flows remaining after implementation of the nine minimum controls and within the criteria specified at II.C.4.a.i or ii, should receive a minimum of:

- Primary clarification (Removal of floatables and settleable solids may be achieved by any combination of treatment technologies or methods that are shown to be equivalent to primary clarification.)
- Solids and floatables disposal
- Disinfection of effluent, if necessary, to meet water quality standard, protect designated uses and protect human health, including removal of harmful disinfection chemical residuals, where necessary."

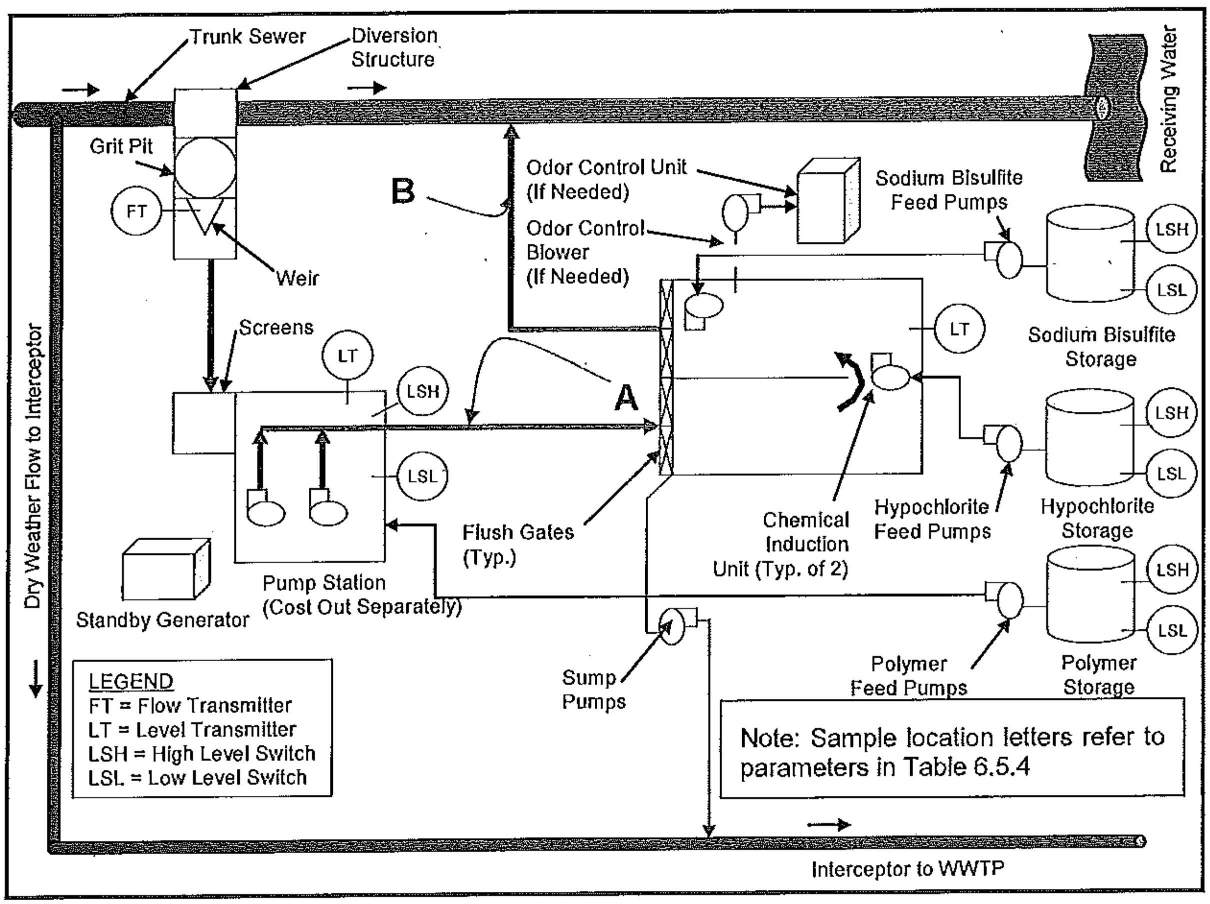
The retention treatment basin is designed to perform as an equivalent to primary treatment. As a result, field testing will consist of sampling to verify adequate TSS removal, disinfection by chlorine, and dechlorination. The wastewater sampling parameters are shown in Table 6.5.4 and the sampling locations in Figure 6.5.14.

TABLE 6.5.4

RETENTION TREATMENT BASIN SAMPLING PARAMETERS

Sample Point	TSS	BOD	pH	Fecal Coli.	Chlorine Residual
A	X	X	X		
B	X	X	X	X	X

FIGURE 6.5.14 RETENTION TREATMENT BASIN SAMPLING LOCATIONS

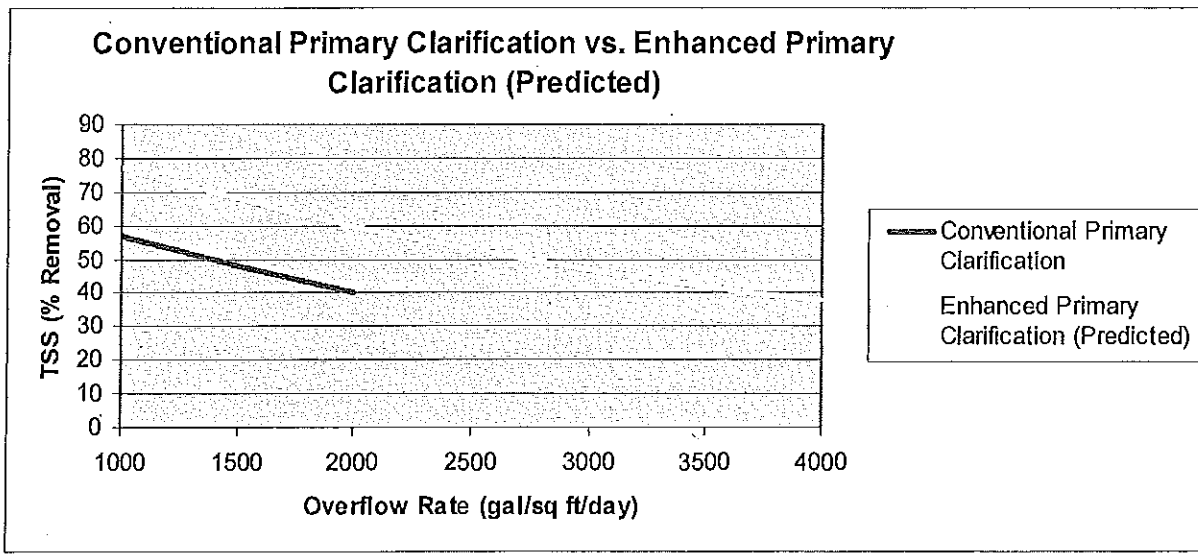


Conventional primary clarification has been shown to remove about 40 percent TSS at an overflow rate of 2,000 gpd/square foot (sq. ft.[1]). An enhanced primary treatment system (addition of chemical coagulation and flocculation using a polymer) was chosen to allow a higher overflow rate and maintain this same 40 percent TSS removal. Enhanced treatment has been shown to increase TSS removal by about 20 percent when compared to conventional primary treatment systems[2]. Using data from conventional primary clarification, a curve was developed to predict TSS removal by the Retention Treatment Basin at higher flow rates. Figure 6.5.15 illustrates this curve.

[1] Conventional primary clarification curve source- Vesilind, Aarne. Water quality treatment center Design. London: IWA Publishing, 2003, Figure 5.5.

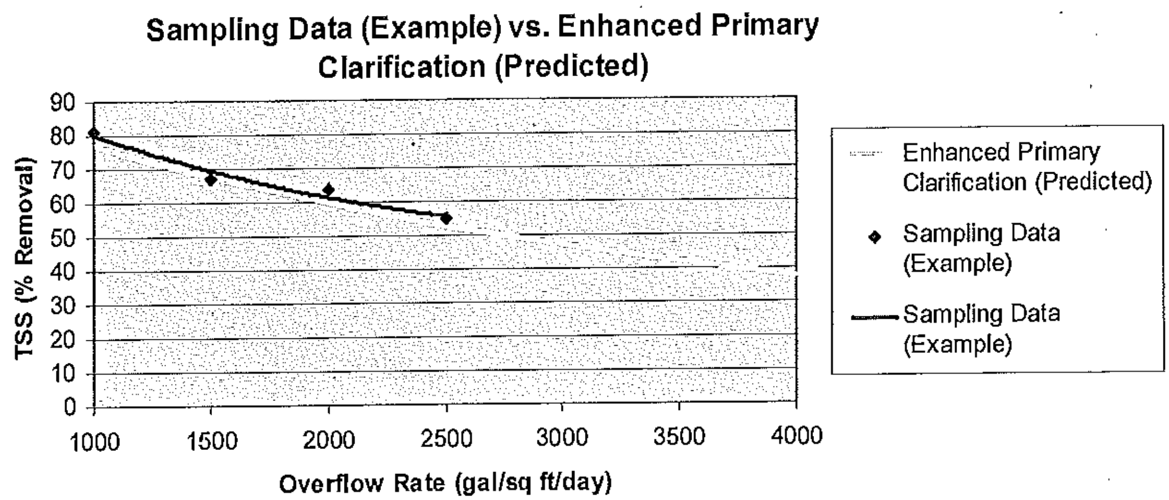
[2] Enhanced primary clarification curve approximated by adding 20 percent TSS removal to conventional primary treatment curve. Source- Vesilind, Aarne. Waste Treatment Plant Design. London: IWA Publishing, 2003, p 5-15.

FIGURE 6.5.15 PREDICTED TSS REMOVAL



Due to the infrequent nature of heavy rain events and the inherent challenges of sampling during these events, the TSS removal at high flow rates will be extrapolated from lower flow rate sampling data. This will be done by plotting TSS removal data on the same graph as the predicted curve and analyzing its trend. The actual sample data points should follow the same path as the predicted TSS removal curve that will be used to demonstrate the TSS removal ability at higher flows. Figure 6.5.16 illustrates this method.

FIGURE 6.5.16 EXAMPLE OF SAMPLING DATA



Although the retention treatment basin was sized based on TSS removal design parameters, particulate BOD will also be removed with the TSS. The anticipated BOD percent removal is uncertain, as the influent wastewater has not yet been characterized. In typical primary treatment, the BOD removal is approximately one-half the TSS removal.

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Twelve months of sampling data (beginning one month after startup) will be analyzed to verify that the secondary treatment system meets or exceeds the design intent, and that both dry weather and wet weather performance is in accordance with current permitted effluent secondary standards. If the plant is functioning as intended, then verification of the operational performance will be documented in a report. If actual performance does not meet the design intent, remedial actions will be recommended in the report to bring the process into compliance.

6.5.3.3 Green Infrastructure, I/I Reduction, and Private Property Program

Monitoring green infrastructure, I/I reduction projects and the effects of a private property program does not diverge far from the methods of monitoring gray infrastructure. Flow monitoring, rain gauges, and water quality sampling are still important in determining the success of "green" initiatives. Gauging the support of the community and their willingness to participate is crucial to success; however, the success of green infrastructure, I/I reduction, and the private property programs will ultimately be gauged by the reduction of sewer overflows. MSD will gauge the success or failure of these programs in each overflow area when deciding to implement further expansion.

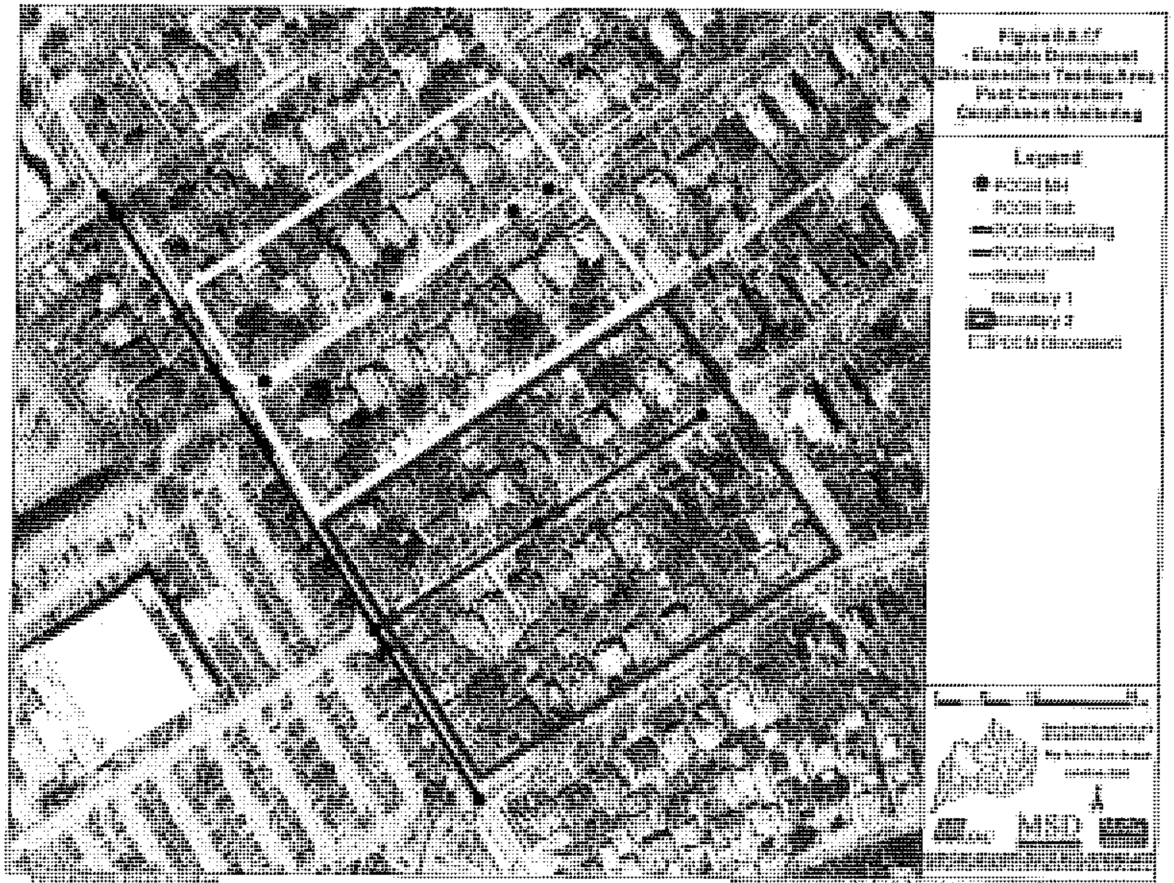
The types of "green" options that will be vital components of MSD's strategy are green roofs, downspout disconnection, rain gardens, bioswales, and pervious pavement. The combination of these components, in small test areas, will allow MSD to monitor its success at reducing stormwater runoff. Similarly, sewer rehabilitation, such as manhole repair and sewer lining, can reduce I/I and, in conjunction with a program to remove illicit sewer connections from private property, can greatly reduce overflow volumes in a collection system.

Case Study Flow Monitoring

Changes in sanitary sewer levels caused by downspout disconnection, dry wells, and pervious pavement will be monitored by utilizing flow meters and rain data. MSD will evaluate the green infrastructure demonstration projects (Volume 2, Section 3.2.1.4) and three I/I case study projects (to be determined by July 1, 2009). A second site near the case study area(s) may be used as a control site – one that has a similar size, ratio of impervious surface to pervious surface, and land use.

Pre-construction testing will be performed on both sites by placing a flow meter downstream of each location to measure flow in the sanitary sewer during wet weather events. A rain gauge will be placed at each location to accurately measure rainfall. After construction and installation of either green infrastructure or I/I reduction measures at a study location, testing will resume at both this and the control sites. Post construction data will be compared to preconstruction data to determine the effectiveness of the green or rehabilitation solutions, utilizing the control site response for comparison. For each case, a brief summary will be generated to report the findings. A case study performed in Burnsville, Minnesota, by Barr Engineering Company (www.landandwater.com Volume 48, No. 5) utilized a similar style of testing. Refer to Appendix 6.5.2. A sample test location setup with the ideal layout for case study flow monitoring is displayed in Figure 6.5.17.

FIGURE 6.5.17 EXAMPLE DOWNSPOUT DISCONNECTION TEST AREA



Site Specific Monitoring

Site specific monitoring is necessary to provide a uniquely detailed look at the effects of green solutions. Three green roof projects (Volume 2, Section 3.2.1.4) will receive site specific monitoring to establish efficacy in reducing runoff. For pre and post construction analysis, flow from the downspouts affected by the green roof will be monitored to gather flow data. Water quality samples will be taken from the water that wells up in the holding tank. Additionally, a rain gauge will be placed on the roof to determine accurately the volume of rain that fell on the roof during each event.

6.5.3.4 Data Quality Assurance

Monitoring "gray" and "green" infrastructure produces a wide variety of data, collected from several internal and external sources. Assuring that procedures associated with the life of a data point or data set, are carried out with the highest quality is a top priority for MSD. MSD intends to implement several quality assurance practices to ensure data accuracy.

Data Collection and Instrument Calibration

Proper data collection practices are crucial to achieving accuracy. Training is provided annually for staff collecting water quality samples at the LTMN and non-LTMN. This training outlines standards for collecting and delivering water quality samples and calibrating sondes. In addition, MSD will contract USGS to administer an additional training program providing more in-depth training on sonde calibration and maintenance. Training will ensure more accurate data for water quality analysis. Further adjustments to training procedures and collection and calibration methods will be made as necessary.

Data Quality Procedures

Rain data is collected by MSD through a network of rain gauges, and Onerain provides a network of radar driven rainfall data. Both data sets provide the data in a live feed to databases at MSD, so there is little opportunity for the data to be corrupted; however, there are opportunities for the data sets to have gaps or become misaligned. Data sets found to have missing or misaligned data will be either corrected or tagged as incorrect.

Flow meter data is currently collected by MSD using telemetry and direct data downloads. The six permanent sewer flow meters are on telemetry and collected and stored in the Plant Information server. The telemetry systems will also be utilized for the 38 proposed long-term meters. Temporary sewer flow meter data and data from a sewer flow meter installed by a contracted company will be uploaded directly from the flow meter and delivered to MSD. Pertinent information about the flow meter will be added to Hansen as a sewer flow meter asset, and the high-resolution data will be migrated to an oracle database. In the migration process, a Quality Assurance application will identify records outside of acceptable parameters. Corrections and verification will be made as necessary.

MSD will establish quality assurance procedures for environmental data by July 1, 2010. The procedures will encompass data aspects such as collection, delivery, formatting, storage, and analysis. Ensuring the integrity of environmental data is of utmost importance in determining the success of MSD projects and programs.

6.5.3.5 Community Behavior Changes

The public information, outreach, and education program (referred to as the public program) is defined in Volume 1, Chapter 3, Section 3.1. The public program has a variety of objectives, but one primary objective is to build and sustain behavior changes in the community that support green infrastructure participation, and personal responsibility for I/I reduction and other source control measures.

Ultimately, the success of the behavior change program is indicated through the reduction in sewer flows measured as part of the overall Post-Construction Compliance Monitoring Program. Since the outcomes of this monitoring effort will take years to identify, additional "course correction" monitoring is needed. Many monitoring techniques are identified in the public program description. These are all intended to measure if the public program is reaching the target audiences with the appropriate messages and if behavior changes are taking place. These measures will be used to make improvements to the public program approach in a continuous improvement approach to public behavior change.

The monitoring approaches described in the public program are all surrogates for the "bottom line" measurement of overflow reduction effectiveness. Overflow reduction effectiveness can only be measured in the pipes, as part of a comprehensive flow monitoring and model calibration approach. In addition to the primary objective of overflow reduction, the public program also has other objectives, such as sustaining support for rate increases needed to finance the IOAP investment, and achieving more general customer relations objectives of MSD. Public outreach, involvement, and education are critical to MSD's overall success; therefore, MSD has decided to integrate customer surveys into the overall IOAP response program.

Customer Surveys

A bi-annual customer survey will be developed both to monitor the effectiveness of the Project WIN public outreach efforts, and to reinforce key messages crucial to successful implementation of Project WIN. For example, Section 3.2.4.3 describes MSD's plans for seasonal messages every year. "Dual purpose" questions relative to the seasonal messages could be:

- During wet weather, how often do you delay running your dishwasher or washing machine to help reduce wet weather sewer overflows? Always? Sometimes? Never?
- What types of water-based recreation does your family participate in? How often? Where? To what extent do you adjust your water-based recreation activities in response to MSD electronic notifications of the potential for sewer overflows or posted sewer overflow warning signs?
- How do you address leaf and lawn clean-up materials? Commercial recycle pick-up? Mulch and leave on lawn? Compost and spread on gardens? Dispose by other means?
- How do you dispose of cooking oil and greasy food waste? Collect and dispose in trash? Flush down the sewer through a garbage disposal system? Other?

Another major focus of behavior modification revolves around increasing and sustaining green infrastructure. Section 3.3.3.1 discusses the sustainability of green infrastructure initiatives.

Questions to residential customers could focus on use of rain barrels and rain gardens, to judge the community understanding and interest in homeowner initiatives relative to pollution control measures on their own property. Examples of these questions could be:

- To what extent do you use "rain barrels" to store rooftop runoff for later use in gardening applications?
- If you wanted a new or replacement rain barrel, where would you go for information? MSD's Project WIN Web site? Louisville Metro's Green Partnership Web site? Other?

Separate surveys may be sent to commercial and industrial customers to assess their understanding of the multiple benefits of green roofs, the availability of MSD incentives to implement green infrastructure improvements, or the interest in exploring a number of ways to increase the effective permeability of their site.

In addition to highly focused questions targeted at specific behavior modification objectives, the survey will also contain more general questions to determine the public interest, awareness and understanding of key water quality issues. For example, asking the survey takers to rank the importance of several water pollution challenges facing our community gives MSD the opportunity to remind people what the challenges are, in addition to receiving feedback to assist in future prioritization of programs. Asking a question about the relative importance of MSD's investments in a variety of Project WIN activities will inform the public about what MSD is doing to reduce sewer overflows in addition to gaining insight on the priorities the community would place on those investments.

In addition to the educational value of the survey, MSD will derive significant benefits from tracking and trending the results of the surveys. Important questions that MSD will answer include:

- How effective has our public outreach program been? Have people received and understood the messages?
- To what extent have the messages actually changed behavior?
- What forms of public outreach have had the greatest impact? Where is our public outreach investment giving us the greatest rewards?

The results of each survey and the trends they reveal will provide important information to assist MSD in continuous improvement of the Project WIN program and specifically the associated public outreach program.

Systematic Performance

Monitoring systematic performance involves the use of environmental data collected from monitoring overflow abatement technologies along with rainfall and stream parameters, to further enhance hydraulic and water quality models and to accurately report overflow reductions and associated stream water quality improvements. As the IOAP projects and programs are implemented over time and compliance monitoring data is collected, the existing conditions for the models will be adjusted and the typical year rainfall and design storms will be simulated to demonstrate compliance with plan targets and assess the state of the streams in relation to the water quality standards. If this periodic assessment proves the plan to be less effective than predicted, in overflow abatement and water quality improvements, adjustments will be made within the plan to adapt and refocus efforts toward the original targets.

6.5.3.6 Adaptive Management

MSD is dedicated to cost-effectively achieving all of the goals and requirements set internally, by outside organizations, and by the Louisville Metro community. MSD is focused on effectively implementing adaptive management practices to achieve its goals. The basic principle of adaptive management is to learn from your successes and failures, and modify your future actions to be more effective in achieving long-term performance objectives. Adaptive management makes use of project performance measurements, such as sewer flow monitoring, observations of overflow events at known trouble spots, and KPDES permit reporting to compare the actual effectiveness of the overflow abatement measures to the assumed performance that served as the basis for design and planning. Observed results will be used to "right-size" subsequent projects to ensure overall IOAP objectives are achieved.

MSD also considers effective control of project activities to be part of adaptive management. Project scheduling will be maintained using industry-standard scheduling software (currently Primavera P6). MSD uses this system to rigorously track and monitor goals and milestones throughout the life of the projects. MSD reports on project progress through quarterly and annual reports, in accordance with the terms of the Consent Decree. MSD will notify the EPA and KDEP of the substantial completion of each capital project, in accordance with the project certification requirements of the Consent Decree.

In conjunction with tracking schedules and progress, MSD is taking major steps towards interactive and transparent access to data. Using web-based dashboards, alert systems, and data query interfaces, MSD will be able to present reliable data to inquiring organizations and individuals in a more effective manner.

Adaptive management is pertinent to the success of reducing volume and eliminating overflows in the Louisville Metro sewer system. Successful management will define the success of capital project certification and effectiveness, and ultimately determine the outcome of the IOAP.

TABLE 6.4.2

SUMMARY OF REVENUES AND EXPENDITURES FOR THE YEARS 2008 THROUGH 2025

Available Revenues	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Wastewater service charges	125,782	133,623	142,308	151,559	161,410	171,901	182,216	192,237	202,810	213,965	225,733	238,148	251,247	265,065	279,644	295,024	311,251	328,369
Stormwater service charges	31,107	32,184	34,276	36,504	38,877	41,404	43,888	46,302	48,848	51,535	54,369	57,360	60,514	63,843	67,354	71,059	74,967	79,090
Misc. revenues	12,729	11,000	12,000	12,000	12,000	12,500	12,875	13,261	13,659	14,069	14,491	14,926	15,373	15,835	16,310	16,799	17,303	17,822
Bond Proceeds	143,168		150,000	200,000	150,000		175,000		300,000			150,000						
Total Available Funds	312,787	194,834	338,584	400,062	362,287	225,805	413,978	251,800	565,318	279,569	294,593	460,434	327,135	344,743	363,308	382,882	403,520	425,281
Expenditures																		
Operating (net)	70,334	71,620	74,980	78,518	82,245	86,167	88,752	91,415	94,157	96,982	99,891	102,888	105,975	109,154	112,428	115,801	119,275	122,854
Additional O&M Projections			1,075	1,250	1,466	1,640	1,811	2,005	2,189	2,387	2,585	2,756	5,805	6,061	6,261	6,459	6,692	6,911
Debt Service	88,173	94,611	98,874	107,645	116,828	120,823	127,591	130,360	141,306	146,076	148,454	153,227	155,591	156,773	156,773	156,487	156,482	156,487
Consent Decree (Escalated)		18,404	54,764	95,447	65,229	55,428	69,467	59,456	67,437	71,715	58,762	65,892	51,306	26,029	19,071	28,542	24,050	8,779
Other Capital (No FA)		24,682	78,061	73,102	25,422	5,681	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000
Force Account	26,510	27,438	28,398	29,392	30,421	31,486	32,588	33,728	34,909	36,130	37,395	38,704	40,058	41,460	42,912	44,413	45,968	47,577
Capital	28,037																	
Total Expenditures	213,055	237,549	336,152	385,354	321,609	301,225	344,209	340,964	363,998	377,290	371,087	387,467	382,735	363,477	361,445	375,702	376,467	366,608
Net	99,73	(42,715)	2,432	14,708	40,678	(75,420)	69,770	(89,164)	201,320	(97,722)	(76,494)	72,967	(55,601)	(18,735)	1,863	7,179	27,053	58,674
Cumulative		57,017	59,450	74,158	114,836	39,416	109,186	20,022	221,342	123,621	47,127	120,094	64,493	45,758	47,621	54,800	81,854	140,527

Assumes rate adjustments as listed on project rate increase schedule

Misc. revenues include assessment income, misc. income from income statement, and gross interest income.

Assumes 3.5% annual increase in operating expenses from 2013 - 2021

Assumes assessment payments drop to $2 million annually from 2013 - 2021

FY 2008 bond proceeds include carryover of $43.2 million from FY 07 plus $100 million new money issue in FY 08

Debt Service assumes 2/3 of principal paid in 30 year & 5% rate for interest payments

Force account was calculated by taking the FY 2008 figure and using an escalation factor of 3.5%

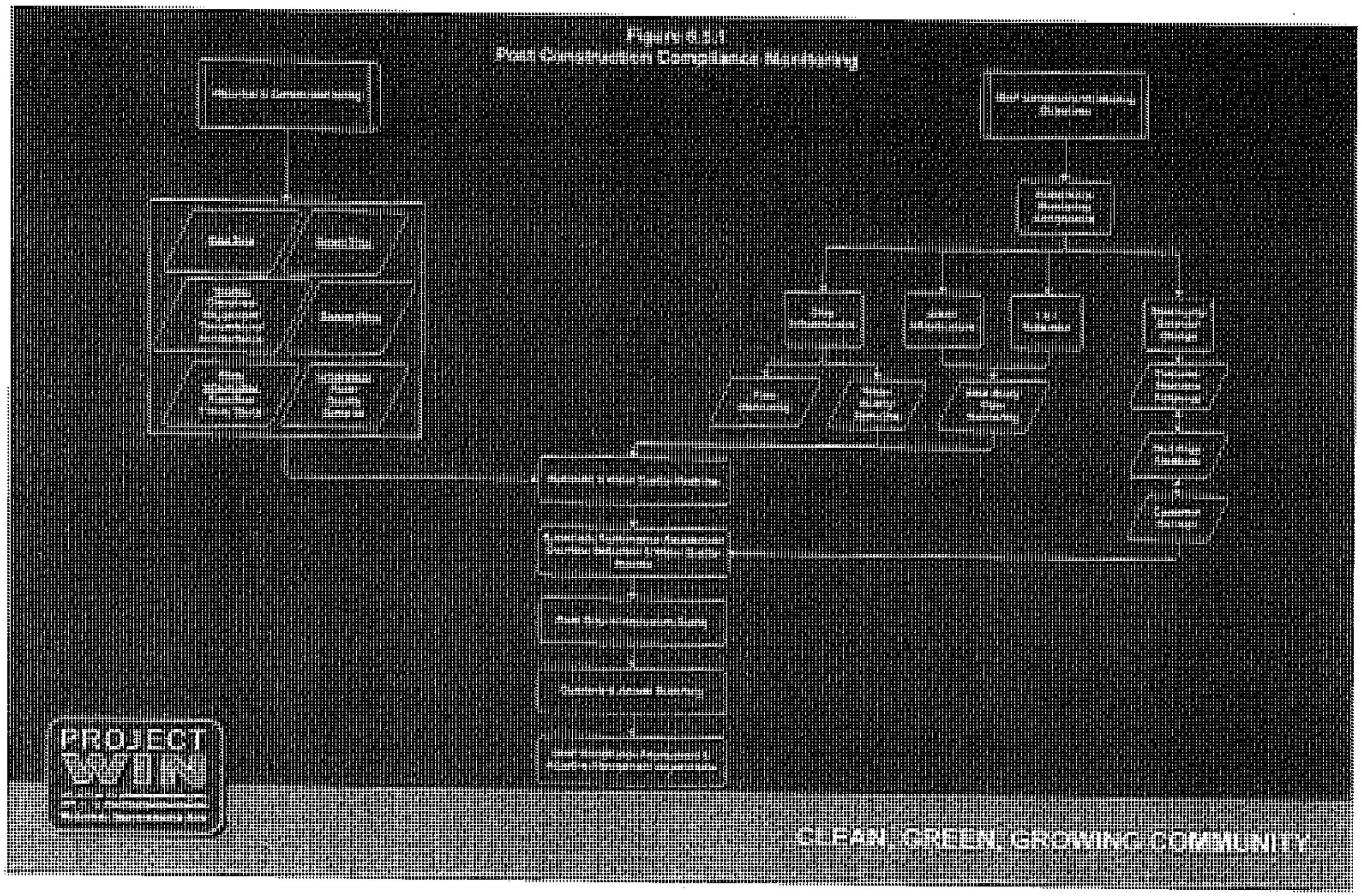

Post Construction Compliance Monitoring
PROJECT WIN
CLEAN, GREEN, GROWING COMMUNITY

FIGURE 6.5.12 WATER QUALITY MONITORING SCHEDULE