May 20, 2010
NRDC HYDROLOGICAL SEPARATION MEETING

SUMMARY

The meeting's focus was on the water management issues surrounding potential permanent separation of Lake Michigan from the Mississippi River Basin.

The following notes are grouped into the major areas of discussion; these notes reflect the discussion at the May 20 meeting. Some of the questions and issues posed will be addressed in the first phase of analysis that NRDC & Shaw are undertaking. Other questions and issues will be addressed during later phases of analysis. These notes represent an attempt to capture the issues under discussion at the May 20th meeting; nothing in this document is intended to reflect the positions of NRDC or any of the attendees.

The next meeting is: **Thursday, July 1, 9:00 a.m. to 12:00 noon (**NRDC, 2 North Riverside Plaza, 24th Floor Conference Center). NRDC & Shaw will present the next phase of analysis, which will identify how green infrastructure could mitigate potential CSO problems in a sewershed affected by permanent separation and identify which of the questions and issues raised at the May 20th meeting will be addressed in this phase.

SUGGESTED CHANGES/QUESTIONS TO ANSWER:

- Add actual pumping rates and storage volumes for TARP.
- The image of TARP used on the slides is always half full – should show variations.
- *Reservoirs:*
  - According to IEPA, we don't know how much storage we'll gain from reservoirs. The Corps removed the lateral, main street tunnel from design. As a result, we don't know the capacity of the one tunnel to carry water to reservoirs and it's too early to model.
- City of Chicago can identify whether bottlenecks in the system are owned by City or MWRD.
  - Reports exist that describe system performance.
- How high would lake level have to get before it tops lock – 6 feet?
- Identify when and why differences in water surface elevation occur.
- There is a divide on the Grand Cal – it is currently sheet piled, but it exists.
- *Economic analysis*
  - There is a need to clearly identify how costs are borne – who pays and who benefits from introduction of invasive species? Who pays and who benefits from how the region currently manages stormwater? Water quality? This analysis would help to nationalize issues.
- When does Racine pump to the river vs. Lake Michigan? Does it pump more frequently than it should? It normally pumps to Stickney for treatment, but it pumps into Bubbly Creek more often than designed to; have tried to fix this for five years. It also depends on direction of flow – new interceptor from Racine to the plant has been proposed but isn't funded.
- Would need additional treatment and pumping of sewage between Stickney and Bubbly Creek to ensure CSOs don't increase.
- A lot of flooding that occurs within the system is at the farthest distance from the treatment facilities – tunnels become full – might be options to add treatment facilities and treat locally, smaller volumes – reduce bottleneck. Best to handle stormwater/wastewater locally.
- Need to examine how the Calumet River discharges and how Indiana handles water.
- *Climate change impacts*
  - How will climate change impact lake levels?
  - Not the daily average flow that's our problem – it's extreme rain events. The system has to work all the time.
  - If Lake levels are permanently lower due to climate change, how would shipping be affected?
- Gulf hypoxia issues – does ELPC have a study that says the City of Chicago/Illinois is the highest contributor to hypoxia?
- *Diversion*

    - What's the potential impact on Illinois' diversion? Opportunities to alleviate potential shortages?
    - The more it rains, the lower our diversion gets – it counts against us by flowing away from Lake – Jack Shafer has done some good studies.
    - What would more frequent, lower lake levels do to our ability to withdraw from Lake Michigan?
    - Look at stormwater diversion to calculate benefit on recharge.
- Importance of water conservation – when we mix clean water with dirty water, it becomes another thing we have to deal with.
- Need to consider reaction of other Great Lakes states to any change in how Illinois manages its water, specifically its diversion.
- Can't ignore potential costs.
- There are formidable barriers to reclaiming wastewater, one of which is the relatively low cost of potable water. Could motivate a keener look at making use of that wastewater – agricultural irrigation? CMAP has done a lot of work in this area.
- Grand Cal – what is status of potential separation at this site?
- MWRD groundwork on effluent polishing in Lake Calumet area is valuable and should be considered (also reviewed in Lockport area).
- Need to do flow modeling.
- Need to look at impact on water supply in other parts of the system.
- Map out ecosystem services and look for values that can be enhanced.
- Tailwater impacts should be modeled.
- Identify integrated, optimal solutions.
- Public communication is critical – change in flood patterns.
- Water quality standards need further analysis.

FLOODPLAIN ISSUES

- Existing floodplain assumes higher river elevation than currently exists, so not likely that existing floodplain would change that much, but we'd expect flooding to occur not just with large storm events.
- New availability of North Shore Channel to alleviate potential floodplain?
- FEMA modeling hasn't been looked at since 1970; it's antiquated, doesn't take into account other opportunities.
- How could we use parks and some of the man-made channels on the south-side to handle stormwater more effectively and become an amenity for neighborhoods?
- There are whole areas of the system where stormwater is a problem -- Little Calumet, Thorn Creek. There's also the Desplaines spilling into Sanitary Ship Canal above the barrier – very concerned with flooding issues when the barrier is being worked on.

WORKPLAN

- Identify opportunities to create local amenities if Cal Sag Channel and other manmade channels no longer needed.

WATER QUALITY

- Potential need to upgrade existing treatment plants is an opportunity.
- *Caution*: In the summer of 2007, BP in Indiana wanted to increase discharge to Lake Michigan; they proposed very slightly increases of ammonia and TSS to Lake Michigan. There was a huge, negative reaction.
- Ammonia, mercury, phosphorous – disinfection is probably easiest thing to achieve – other things would might be technologically challenging.
- Important to remember that not all water would necessarily go to Lake Michigan.
- Also have to worry about water quality downstream – huge issue on canals, might need a minimum of 4-5 cfs to operate Lockport – without baseflow, would essentially drain the flow in canal to almost nothing – how would navigation be maintained?
- Might need more wastewater treatments in Deerfield and Highland Park.
- Would need to model – southern portion of Lake Michigan is a closed system.
- Can use flow on either side of barrier to deal with flow, water quality issues.
- Can treat wastewater and stormwater differently.

- Really refined nutrient treatment can treat to new levels, but could it handle the volume?
- Need to look at drinking water standards as well.
- Pharmaceuticals and personal care products would need to be addressed

OUTREACH

- How do you explain this as a series of extremely local problems? How do you describe this as helping people with the problems they currently have, i.e. basement flooding? Must ensure that separation doesn't exacerbate a problem.
- Shouldn't just be about basement flooding, should be flooding in general.
- We should be intensely sensitive about how we talk about returning water to Lake Michigan.

GREEN INFRASTRUCTURE (GI)

- Value and use of GI in reducing stormwater – usable component for overlaying the kind of traditional long term control plan.
- How much recharge of Lake Michigan could we get from GI? if you increase recharge in the mile and half along the Lake by 10%, how many more people could be accommodated with clean water? DWM has done of this modeling; IDNR has some figure as well.
- Have to overcome perception of lack of performance data for GI.
- Marty Jaffe's GI study should be complete soon and should be helpful to this analysis.

PARKING LOT:

- Transportation (commerce & recreation) impacts need to be described, modeled and understood.
  - Both should be enhanced by separation.
  - Should invite transportation interests to the process as soon as possible.
- A host of legal issues (permitting, NEPA, etc.) will have to be considered.
- Construction specifications must be developed.
- All parking lot issues should be summarized in longer report.

It was suggested that all participants could agree on the following:

- The region could do a better job handling rainwater.
- Protecting Lake Michigan is the highest priority.
- Lowering the amount of water currently used for sanitary purposes would be beneficial.
- Water conservation should be a priority.

It was also suggested to focus this initial study on current risks and opportunities – we currently know the risks associated with water quality, stormwater management, etc. How would separation benefit water quality and stomwater management? What other benefits, i.e. invasive species, diversion, could it have?

ATTENDEES:

- Henry Henderson, NRDC
- Thomas Cmar, NRDC
- Bill Abolt, Shaw Environmental
- John Ferris, Shaw Environmental
- Hala Ahmed, CMAP
- Candice Bauer, USEPA
- Lenore Beyer-Clow, Openlands
- Joel Brammeier, Alliance for the Great Lakes
- Clark Bullard, Prairie Rivers Network
- Pat Carey, City of Chicago Mayor's Office
- Joe Deal, City of Chicago Mayor's Office

- Jack Darin, Sierra Club
- Josh Ellis, MPC
- Peter Skosey, MPC
- Bill Eyring, CNT
- Molly Flanagan, Joyce Foundation
- Margaret Frisbie, Friends of the Chicago River
- Jennifer Hill, National Wildlife Federation
- Karen Hobbs, Consultant
- Dan Injerd, IDNR
- Tim Loftus, CMAP
- Bob Newport, USEPA
- Janet Pellegrini, USEPA
- John Spatz, City of Chicago Department of Water Management
- Sean Wiedel, City of Chicago Department of Environment
- Rob Sulski, IEPA
- Marcia Wilhite, IEPA

JULY 1, 2010
HYDROLOGICAL ANALYSIS OF HYDROLOGICAL SEPARATION
MEETING NOTES

I. Welcome/Introductions

Henry Henderson, NRDC, welcomed and summarized the purpose of the meeting and NRDC's approach to the range of stormwater, wastewater and transportation challenges facing the region, which The Asian carp threat is simply the latest, but not the last, invasive species threat facing the Great Lakes and the Mississippi River basins. We must rethink our approach towards the management of water. This should be a very public process, engaging a wide diversity of interests. NRDC is also working with a consultant to better understand the movement of goods in the region; NRCD would also like to engage this group, in reviewing that analysis, at the appropriate time.

NRDC and Shaw took the comments made at the May 20 meeting, as well as results of individual meetings, and reflected as many as possible in this phase of the analysis. NRDC plans to release the results of this analytic phase by the end of the summer; NRDC would like this to be an iterative process.

1. Review of May 20 Stakeholder Meeting (John Ferris, Shaw Environmental)

III. Analysis

Shaw built off of existing City work; using the analysis of one sewershed, Trunk Sewer AreaA1, which was done by CDM & CH2M Hill. The area is basically the junction of the North Shore Channel and the North Branch of the Chicago River; it has 14 CSOs (7 on North Shore Channel, 7 on North Branch of Chicago River), with a total area of 2,484 acres.

Shaw analyzed how different types of green infrastructure (GI), including bioswales, porous pavement, and street trees, could improve water quality and mitigate flooding, while also potentially providing an additional level of protection for homes and communities.

This approach assumes that existing infrastructure approaches could be modified to include GI upfront. Every infrastructure decision should be made with stormwater management in mind, staying within existing capital plan.

Chose to model based on a separation scenario at Bubbly Creek, but could have chosen anywhere in the system.

Shaw used SLAMM (Source Loading and Management Model) for the specific purpose of analyzing GI. Variables include: soil permeability, size/dimensions, storage, overflow weirs. Best Management Practices (BMPs) include: porous pavement, rain gardens, bioretention, infiltration, rain barrels/cisterns, hydrodynamic devices, wet detention, catchbasin cleaning, street sweeping.

The goal of the analysis is to “shave off” lower rainfall events so that they're no longer providing pollutant loads to waterways and providing a flooding risk.

Shaw also looked at how decentralized storage facilities could be utilized; for example, providing detention basins under concrete aprons or bioswales.

Shaw quantified the reduction in the volume of stormwater runoff (and its corresponding pollutant reduction in CSOs) that could be taken up by specific GI practices applied to the study area. By installing street trees, bioswales, raingardens and porous pavement on 50 percent of the available area within the study area, Shaw estimated that a:

- 30 percent reduction in the volume of water entering the sewer system, reducing the number of CSOs and corresponding pollutants discharged to the river by 30 percent.
- 30 percent reduction in pollutants entering the sewer system, potentially reducing treatment needs further in the system.
- Approximate cost: $7M to install GI measures.

- Some larger storms would be downsized and smaller storms would be made much less of a threat.
- Miscellaneous analysis notes:
  - Under Bubbly Creek scenario: boats couldn't go from the Cal Sag Channel into Lake Michigan.
  - Chicago River levels: would need to address gravity issue, potentially with low head, high water pumps; would also need to ensure that invasives don't move in the opposite direction, i.e. from Great Lakes to the Illinois or Mississippi Rivers.
  - Wastewater treatment facilities, especially at the North Shore plant, would need to be improved to meet Lake

Michigan water quality standards. NRDC and Shaw looked at treatment trains other Lake Michigan cities have in place and believe it is an achievable goal to expect the North Shore and other treatment plants to provide sufficient treatment to allow discharge into Lake Michigan. It's important to note that a significant public education campaign would be needed.

QUESTIONS/COMMENTS ON THE ANALYSIS:

- What improvements must be made at the North Shore treatment plant? We shouldn't assume that MWRD wouldn't need to treat for phosphorous and disinfect at plants in any case.
- Need to further analyze water quality coming over North Shore dam; Shaw has compiled information, but hasn't processed.
- Bioswales & porous pavement are most effective for capturing rainwater; the type of storage underneath is the variable.
- Analysis on the cost needs to be much more specific, fully identifying costs and benefits and the incremental cost of incorporating BMPs. Part of cost effectiveness is how specific BMPs are integrated into capital plans; by fully understanding the region's capital budgets and careful identification of opportunities, these measures could be incorporated into existing capital plans. Where are strategic opportunities to make changes and prioritize from low to high cost? How much can be done by changing specs at normal pace of activities? Who makes the investment, i.e. federal, state or local governments?
- This is a high level of analysis using standard available data; would need to work closely with a community to fully develop numbers.
- GI strategies don't include the ongoing cost for maintenance; neither does gray infrastructure.
- Expand cost to cost of flooded basements.
- Look at case studies in the region, Kane County, among others. Most municipalities don't have standards properly in place for green infrastructure; City of Chicago on leading edge of GI standards.

GENERAL QUESTIONS/COMMENTS:

- Ammonia numbers should be displayed differently (NRDC will meet with Sierra Club and ELPC to address).
- Gurnee – goes to Desplaines River.
- Dewatering of Sanitary Ship Canal in Lockport is through a separate control structure that's a mile upstream of the powerhouse and lock.
- When reservoirs are available: how much of forecasted rain can they accommodate? Expectation is that CSO frequency would be reduced by 90%, according to Pete Mulvaney, DWM.
- Tradeoff of waste going to Chicago River or Lake Michigan is a false one. Need to protect both.
- Water level difference between Lake Michigan and Lockport is about 2 feet in normal flows; 12 foot difference in storm flows.
- Need to make sure taking into account environmental justice issues.
- How do we message that this is an ongoing improvement and investment in ecosystem?
- How would water quantity be protected?
- How long would it take to implement separation and how much would it cost? Where would the funding come from?
- Need to include existing and planned wetlands, forest preserve districts, park districts, etc.
- Water quality issue: MWRD has trouble meeting dissolved oxygen standards right now – would need to continue to flush the system. If pumps are installed to take dry weather flow and send it to the other side, will still have flow. Need to address aeration standards. North Shore plant would meet standards at Jones Island right now; what happens in the waterways after is the question.
- Raising treatment levels must be tied to sewershed upgrades.
- Huge public relations challenge if water returned to Lake Michigan.
- When will other constituencies, such as the boat and barge operators, "Unlock Our Jobs" coalition, be brought into discussion?
- Would be helpful to see visual of separation.
- NRDC must focus on where we have the ability to affect change and policy; make sure you move beyond carp.

ATTENDEES:

Peter Skosey, MPC
Janet Pellegrini, USPA
Hala Ahmed, CMAP
Joel Brammeier, Alliance for the Great Lakes
Martin Felsen, Archeworks/Urban Lab
Cindy Skrudrud, Sierra Club
Jack Darin, Sierra Club
Bill Abolt, Shaw Environmental
Albert Ettinger, ELPC
Josh Ellis, MPC
Dave Ullrich, Great Lakes St. Lawrence Cities Institute
Bob Newport, USEPA
Rob Sulski, IEPA
Kim Israel, IEPA
Marcia Willhite, IEPA
Nancy Williamson, IDNR (for Chicago Wilderness)
Ann Alexander, NRDC
Allison Gruber, NRDC
Steve Melching, Marquette University
Pam Kaput, Great Lakes St. Lawrence Cities Institute
Melanie Rochette-Mercier, Great Lakes St. Lawrence Cities Institute
Susanne Schnell, Archeworks
Marc Smith, NWF
John Quail, FOCR

Sean Wiedel, Chicago Department of Environment
Margaret Frisbie, FOCR
Candice Bauer, USEPA
Peter Mulvaney, Chicago Department of Water Management
Lenore Beyer-Clow, Openlands
Pat Carey, City of Chicago Mayor's Office
Molly Flanagan, Joyce Foundation
Henry Henderson, NRDC
Karen Hobbs, Consultant
John Ferris, Shaw Environmental

TABLE 6

STREAM GAGES USED IN HYDROLOGIC SEPARATION STUDY

Source: Shaw Environmental Group, 2010, based on USGS data – USGS Water Data for the Nation http://waterdata.usgs.gov/nwis/.

	USGS Station ID	Station Name	Drainage Area (sq mi)	Days of Measureme
1	5536121	CHICAGO RIVER AT CHICAGO LOCK AT CHICAGO, IL	--	3,499
2	4087440	LAKE MICHIGAN AT CHICAGO LOCK AT CHICAGO, IL	--	3,595
3	9087044	Calumet Harbor, IL	--	962
4	5536101	NORTH SHORE CHANNEL AT WILMETTE, IL	--	2,556
5	5536123	CHICAGO RIVER AT COLUMBUS DRIVE AT CHICAGO, IL	--	3,652
6	5536000	NORTH BRANCH CHICAGO RIVER AT NILES, IL	100	21739
				6,747
7	5536105	NORTH BRANCH CHICAGO RIVER AT ALBANY AVENUE AT CHICAGO, IL	113	6863
				5,351
8	5534500	NORTH BRANCH CHICAGO RIVER AT DEERFIELD, IL	19.7	18411
				3,110
9	5536118	NORTH BRANCH CHICAGO RIVER AT GRAND AVENUE AT CHICAGO, IL	180	2,204
10	5536140	CHICAGO SANITARY AND SHIP CANAL AT STICKNEY, IL	296	53
				20
11	5535000	SKOKIE RIVER AT LAKE FOREST, IL	13	21387
				5,564
12	5535070	SKOKIE RIVER NEAR HIGHLAND PARK, IL	21.1	15,586.0
				5564
13	5535500	WEST FORK OF NB CHICAGO RIVER AT NORTHBROOK IL	11.5	21075
				5,552
14	5536995	CHICAGO SANITARY AND SHIP CANAL AT ROMEOVILLE, IL	739	366
15	5537000	CHICAGO SANITARY AND SHIP CANAL AT LOCKPORT, IL	740	16,801
16	5536890	CHICAGO SANITARY AND SHIP CANAL NR LEMONT, IL	738	1,964
17	415107087400101	SEWER (SMH-2) AT BLUE ISLAND AVE AT CHICAGO, IL	--	246
18	5535150	SKOKIE RIVER AT NORTHFIELD, IL	29.1	19
				18
19	5534900	SKOKIE RIVER AT LAKE BLUFF, IL	8.17	656
				656

TABLE 9
GENERAL USE WATER QUALITY STANDARDS

Source: Shaw Environmental Group, 2010; extracted from 35 Illinois Administrative Code Section SUBTITLE C PART 302.

203 Offensive Conditions

Free From
sludge or bottom deposits, floating debris, visible oil, odor, plant or algal growth, color or turbidity of other than natural origin

	Parameter	Numeric Standard	Units
204	pH	6.5 - 9.0	
205	Phosphorus	0.05	mg/L
206	Dissolved Oxygen (March - July) anytime	5	mg/L
	7 day mean	6	mg/L
	Dissolved Oxygen (August - February) anytime	3.5	mg/L
	7 day mean	4	mg/L
	20 day mean	5	mg/L
207	Radioactivity (Gross)	100	pCi/L
	Radioactivity (Strontium 90)	2	pCi/L
	Radioactivity (annual average Radium 226 & 228)	3.75	pCi/L
208	Numeric Standards- Aquatic Organisms		
	Arsenic (trivalent, dissolved)	360	µg/L
	Cadmium (dissolved)		
	Chromium (hexavalent, total)	16	µg/L
	Chromium (trivalent, dissolved)		
	Copper (dissolved)		
	Cyanide	22	µg/L
	Lead (dissolved)		
	Mercury (dissolved)	2.2	µg/L
	Nickel (dissolved)		
	TRC	19	µg/L
	Zinc (dissolved)		
	Benzene	4200	µg/L
	Ethyl-benzene	150	µg/L
	Touene	2000	µg/L
	Zxylene(s)	920	µg/L
	Numeric Standards- Human Health		
	Mercury	0.012	µg/L
	Benzene	310	µg/L
	Barium (total)	5	mg/L
	Boron (total)	1	mg/L
	Chloride (total)	500	mg/L

		Fluoride	1.4	mg/L
		Iron (dissolved)	1	mg/L
		Manganese (total)	1	mg/L
		Phenols	0.1	mg/L
		Selenium (total)	1	mg/L
		Silver (total)	5	µg/L
		Sulfate	500 - 2,000	mg/L
209	Fecal Coliform (May - October) Geometric mean of 5 samples		200	/100 ml
		(10% of samples over 30 day period)	400	/100 ml
210	Other Toxics			
211	Temperature		60^{O} or 90^{O}	
212	Total Ammonia Nitrogen		15	mg/L

TABLE 10
SECONDARY USE WATER QUALITY STANDARDS
Source: Shaw Environmental Group, 2010: extracted from 35 Illinois Administrative Code Section SUBTITLE C PART 302

403	Unnatural Sludge **Free From** unnatural sludge or bottom deposits, floating debris, visible oil, odor, unnatural plant or algal growth, unnatural color or turbidity		
	Parameter	Numeric Standard	Units
404	pH	6.0 - 9.0	
405	Dissolved Oxygen	4	mg/L
	Dissolved Oxygen (Calumet-Sag Channel)	3	mg/L
407	Chemical Constituents		
	Ammonia Un-ionized (as N)	0.1	mg/L
	Arsenic (total)	1	mg/L
	Barium (total)	5	mg/L
	Cadmium (total)	0.15	mg/L
	Chromium (hexavalent, total)	0.3	mg/L
	Chromium (trivalent, total)	1	mg/L
	Copper (total)	1	mg/L
	Cyanide (total)	0.1	mg/L
	Fluoride (total)	15	mg/L
	Iron (total)	2	mg/L
	Iron (dissolved)	0.5	mg/L
	Lead (total)	0.1	mg/L
	Manganese (total)	1	mg/L
	Mercury (total)	0.0005	mg/L
	Nickel (total)	1	mg/L
	OF&G	15	mg/L
	Phenols	0.3	mg/L
	Selenium (total)	1	mg/L
	Silver	1.1	mg/L
	Zinc (total)	1	mg/L
	Total Dissolved Solids	1500	mg/L
408	Temperature	93^{O} or 100^{O}	
409	Cyanide	0.1	mg/L
410	Toxics half life	96-hours	

TABLE 11
LAKE MICHIGAN WATER QUALTIY STANDARDS
Source: Shaw Environmental Group, 2010: extracted from 35 Illinois Administrative Code Section SUBTITLE C PART 302

	Free From sludge or bottom deposits, floating debris, visible oil, odor, unnatural plant or algal growth, color or turbidity of other than unnatural origin						
				Numeric Standard	Units		
502	Dissolved Oxygen anytime			5	mg/L		
	16 hours per day			6	mg/L		
503	pH (in open water)			7 - 9			
	pH (other waters)			6.5 - 9			
504	Chemical Constituents						
	a. All waters of Lake Michigan		Acute Numeric Standard	Cronic Numeric Standard	HHS Numeric Standard	Units	
		Arsenic (trivalent, dissolved)	340	148		µg/L	
		Chromium (hexavalent, total)	16	11		µg/L	
		Cyanide	22	5.2		µg/L	
		Selenium (dissolved)	NA	5		µg/L	
		TRC	19	11		µg/L	
		Benzene	3900	800	310	µg/L	
		Chlorobenzene	NA	NA	3.2	mg/L	
		2,4-Dimethylphenol	NA	NA	8.7	mg/L	
		2,4-Dinitrophenol	NA	NA	2.8	mg/L	
		Endrin	0.086	0.036		µg/L	
		Ethylbenzene	150	14		µg/L	
		Hexachloroethane	NA	NA	6.7	mg/L	
		Methylene chloride	2.6		2.6	mg/L	
		Parathion	0.065	0.013		µg/L	
		Toluene	2000	610	51	µg/L	
		Trichloroethylene	NA	NA	370	µg/L	
		Xylene(s)	1200	490		µg/L	
	b. All waters of Lake Michigan not to exceed		Numeric Standard	Units			
		Barium (total)	5	mg/L			
		Boron (total)	1	mg/L			
		Chloride (total)	500	mg/L			
		Fluoride	1.4	mg/L			

		Iron (dissolved)	1	mg/L			
		Manganese (total)	1	mg/L			
		Phenols	0.1	mg/L			
		Sulfate	500	mg/L			
		Total Dissolved Solids	1000	mg/L			
	c. In Lake Michigan not to exceed						
		Arsenic (total)	50	g/L			
		Barium (total)	1	mg/L			
		Chloride	12	mg/L			
		Iron (dissolved)	0.3	mg/L			
		Lead (total)	50	g/L			
		Manganese (total)	0.15	mg/L			
		Nitrate-Nitrogen	10	mg/L			
		Phosphorus	7	g/L			
		Selenium (total)	10	g/L			
		Sulfate	24	mg/L			
		Total Dissolved Solids	180	mg/L			
		Oil (hexane solubles or equivalent)	0.1	mg/L			
		Phenols	1	g/L			
	d. In Lake Michigan HHS						
		Benzene	12	g/L			
		Chlorobenzene	470	g/L			
		2,4-Dimethylphenol	450	g/L			
		2,4-Dinitrophenol	55	g/L			
		Hexachloroethane (total)	5.3	g/L			
		Lindane	0.47	g/L			
		Methylene chloride	47	g/L			
		Toluene	5.6	mg/L			
		Trichloroethylene	29	g/L			
	e. In Lake Michigan Basin Bioassumulation		Acute Numeric Standard	Cronic Numeric Standard	HHS Numeric Standard	Wildlife Numeric Standard	Units
		Mercury (total)	1,700	910	3.1	1.3	ng/L
		Chlordane	NA	NA	0.25	NA	ng/L
		DDT and metabolites	NA	NA	150	11	pg/L
		Dieldrin	240	56	0.0065	NA	ng/L
		Hexachlorobenzene	NA	NA	0.45	NA	ng/L
		Lindane	0.95	NA	0.5	NA	g/L
		PCBs (class)	NA	NA	26	120	pg/L
		2,3,7,8-TCDD	NA	NA	8.6	3.1	fg/L
		Toxaphene	NA	NA	68	NA	pg/L
505	Fecal Coliform		Numeric Standard	Units			
		Lake Michigan	20	/100mL			

		Basin geometic mean	200	/100mL			
		< 10% per 30 day	400	/100mL			
525	Radioactivity						
		Beta	100	pCi/L			
		Strontium 90	2	pCi/L			
		radium 226 & 228	3.75	pCi/L			
535	Ammonia Nitrogen						
		Total	15	mg/L			
			Acute Numeric Standard	Cronic Numeric Standard	Units		
		Un-ionized (April - October)	0.33	0.057	mg/L		
		Un-ionized (November - March)	0.14	0.025	mg/L		

Table 12

Waterbodies within the CAWS and the North Branch of the Chicago River on the ILLINOIS' 2008 303(D) LIST

Source: Shaw Environmental, 2010 ; based on http://www.epa.state.il.us/water/tmdl/303d-list.html

Segment ID	Waterbody	Miles/ Acres	Applicable WQS	Impaired Designated Use	Potential Causes
IL_GI-03	Chicago Sanitary & Ship Canal	5.92	Secondary Contact and indigenous aquatic life	Fish Consumption Indigenous Aquatic Life	Mercury, Polychlorinated biphenyls (Total)
IL_HC-01	South Branch Chicago R.	3.97	Secondary Contact and indigenous aquatic life	Fish Consumption	Polychlorinated biphenyls
IL_HCA-01	South Fork. South Branch Chicago R	3.08	Secondary Contact and indigenous aquatic life	Indigenous Aquatic Life	pH, Phosphorus (Total)
IL_HCB-01	Chicago RIVER	2.56	Secondary Contact and indigenous aquatic life	Aquatic Life Fish Consumption Primary Contact Recreation	Phosphorus (Total), Silver Mercury, Polychlorinated biphenyls Fecal Coliform
IL_HCC-02	North Branch Chicago River	2.06	General Use	Fish Consumption	Mercury, Polychlorinated biphenyls
IL_HCC-07	North Branch Chicago RIVER	11.49	General Use	Aquatic Life Fish Consumption Primary Contact Recreation	Aldrin, Chloride (1), DDT, Hexachlorobenzene, pH, Phosphorus (Total), Total Suspended Solids (TSS) Polychlorinated biphenyls Fecal Coliform (1)
IL_HCC-08	North Branch Chicago RIVER	5.48	Secondary Contact and indigenous aquatic life	Fish Consumption Indigenous Aquatic Life	Polychlorinated biphenyls Iron, Oil and Grease, Phosphorus (Total)
IL_HCCA-02	North Shore Channel	4.25	Secondary Contact and indigenous aquatic life	Primary Contact Recreation Aquatic Life Fish Consumption	Fecal Coliform Nickel, Phosphorus (Total), Polychlorinated biphenyls Zinc
IL_HCCA-04	North Shore Channel	3.38	Secondary Contact and indigenous aquatic life	Fish Consumption	Mercury, Polychlorinated biphenyls
IL_HCCB-05	W. Fk. North Branch Chicago R	14.74	General Use	Aquatic Life Primary Contact Recreation	Chloride (1), DDT, Phosphorus (Total), Total Suspended Solids (Fecal Coliform (1)
IL_HCCC-02	Mid Fk. North Branch Chicago RIVER	18.82	General Use	Aquatic Life Primary Contact Recreation	Chloride (1), DDT, Hexachlorobenzene,

					Manganese, Sedimentation/Siltation, Total Suspended Solids (Fecal Coliform (1)
IL_HCCC-04	Mid Fk. North Branch Chicago RIVER	3.29	General Use	Aquatic Life Primary Contact Recreation	Aldrin, Chlordane, Chloride (1), DDT, Hexachlorobenzene, pH, Phosphorus (Total), Sedimentation/Siltation, Water Temperature, Total Suspended Solids (Fecal Coliform (1)
IL_HCCD-01	Skokie RIVER	13.32	General Use	Aquatic Life Primary Contact Recreation	pH, Phosphorus (Total), Total Suspended Solids (Fecal Coliform (1)
IL_HCCD-09	Skokie RIVER	1.72	General Use	Aquatic Life Primary Contact Recreation	pH, Phosphorus (Total), Sedir Fecal Coliform (1)
IL_RHB	HUMBOLDT PARK LAGOON	19.90	General Use	Fish Consumption	Mercury
IL_RHE	MARQUETTE PARK LAGOON	40.0	General Use	Fish Consumption	Mercury
IL_RHJ	SKOKIE LAGOONS	225.00	General Use	Aesthetic Quality Fish Consumption	Phosphorus (Total) (1), Total Suspended Solids (Mercury

Table 13
NPDES Permitted Discharges to the North Branch of the Chicago River
Source: Shaw Environmental, 2010; based on " North Branch Chicago River Watershed-Based Plan," Table 3-51, p3-122.

Facility ID	Receiving Water	County	Facility Name	Discharge Type	Type of Facility
IL0028053	Stickney	Cook Co.	Water Reclamation Plant	Influent Monitoring, Excess Flow and	Wastewater Reclamation Facility
IL0028061	Calumet	Cook Co.	Water Reclamation Plant	Sewage Treatment Plant Outfall	Wastewater Reclamation Facility
IL0028070	Lemont	Cook Co.	Water Reclamation Plant	Influent Monitoring, Excess Flow and	Wastewater Reclamation Facility
IL0028088	North Shore Channel	Cook Co.	North Shore Water Reclamation Plant	Influent Monitoring, Excess Flow and Sewage Treatment Plant Outfall	Wastewater Reclamation Facility
IL0028347	West Fork of the Chicago River	Lake Co.	Deerfield WWTP	Influent Monitoring, Excess Flow and Sewage Treatment Plant Outfall	Wastewater Reclamation Facility
IL0030171	Skokie River	Lake Co.	North Shore Sanitary District - Clavey Road	Influent Monitoring, Combination Water and Excess Flow	Wastewater Treatment Plant
IL0072389	West Fork of the Chicago River	Cook Co.	Village of Golf	Combined Sewer Overflow	CSO
ILG910017	General Use	Cook Co.	Unocal Corp Northfield Heating	General Use	Pumps and Pumping Equipment
IL0066435	Middle Fork of the Chicago River	Lake Co.	Abbott Laboratories	Overflow, Stormwater Drainage	Pharmaceutical Preparations
IL0074128	Middle Fork of the Chicago River	Lake Co.	Abbott Laboratories	Cooling Tower, NCCW and Reverse Osmosis	Pharmaceutical Preparations
IL0073156	Skokie River	Lake Co.	Brent America, Inc.	Treated Groundwater	Metals
IL0068951	Skokie River	Lake Co	Central Lake County JAWA	NCCW	Production and Distribution of Potable Water
IL0074977	Skokie River	Lake Co.	Great Lakes Naval Training Center	Treated Contaminated	Naval Training Center

				Groundwater	
IL0071714	West Fork of the Chicago River	Lake Co.	Deerfield Reservoir 29A	Monitoring Well	Flood Control Reservoir Outfall
IL0066991	West Fork of the Chicago River	Cook Co.	Prairie Materials Yard 21	Ready Mix Concrete Manufacturing	Stormwater Retention Basin
ILG250168	West Fork of the Chicago River	Cook Co.	Underwriters Laboratories	Non-Contact Cooling Water (NCCW) and Overflow Commercial	Testing Laboratory