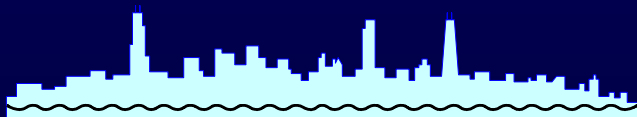


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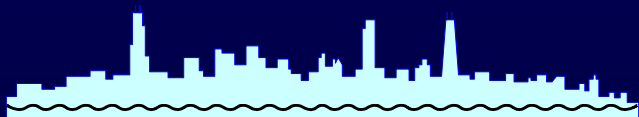
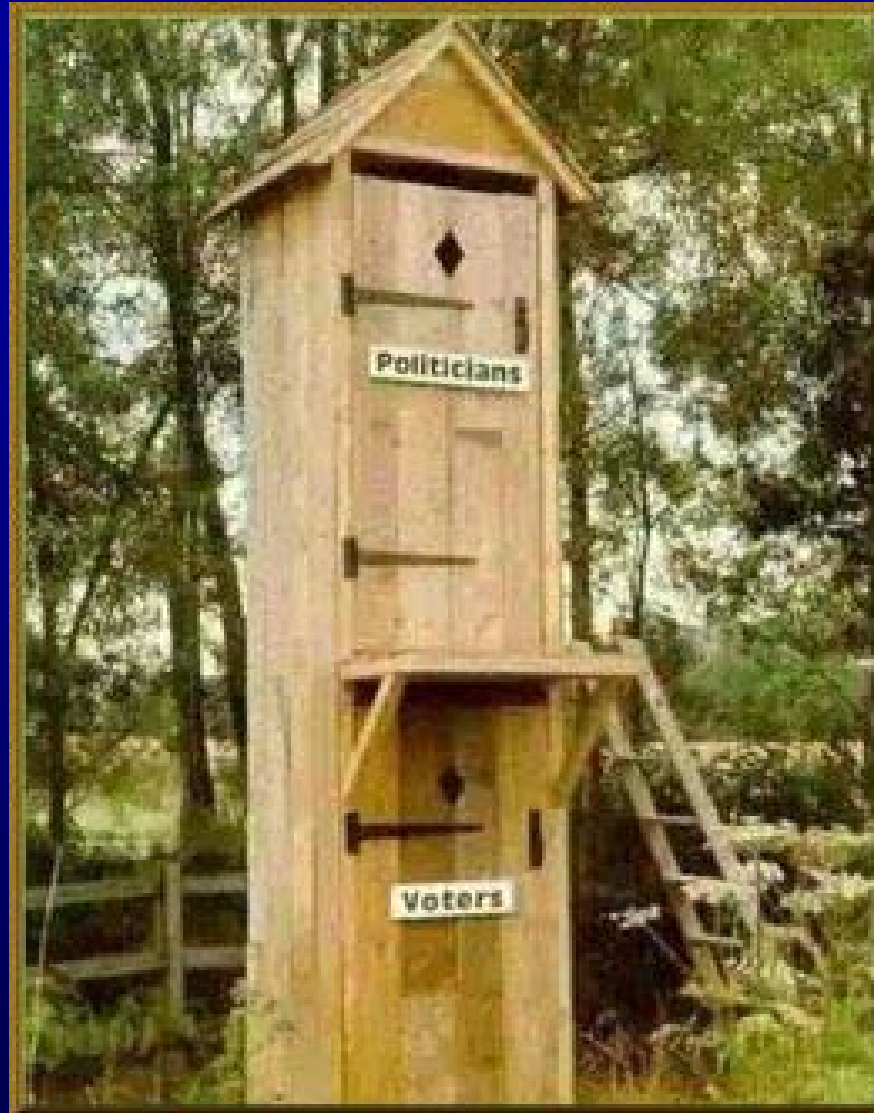


"Saneamiento de aguas pluvio-cloacales y control de descargas en aguas superficiales de la región del Gran Chicago, Estados Unidos"

Sergio Serafino



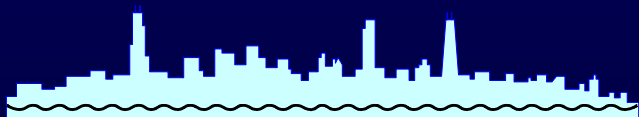
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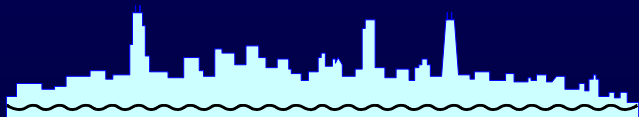
# Contenido

- Misión del Distrito
- Historia del Distrito
- Responsabilidades del Distrito
- Clean Water Act
- Proceso de Tratamiento de Aguas Contaminadas (lodos activados)
- Conductos pluvio-locales
- Túnel Profundo para el control de descarga de aguas superficiales en áreas con conductos unitarios



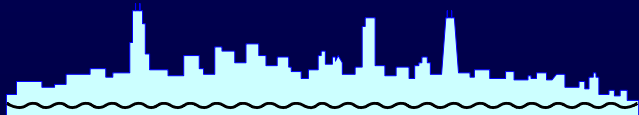
# Misión del Distrito

Protección de la seguridad y salud pública, protección de la calidad de la fuente de agua potable (Lago Michigan), mejorar la calidad del agua de los ríos de la región, protección de hogares y negocios contra inundaciones y manejo del agua como un recurso vital para su área de servicio.



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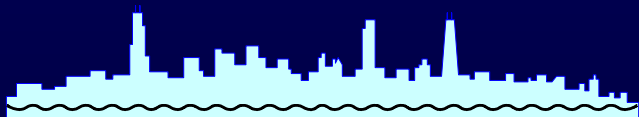
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# Gran Rosario-Gran Chicago

- Aglomerado Gran Rosario;
  - Habitantes aprox.: 1.190.000
  - Superficie : 580 km<sup>2</sup>
- Aglomerado Gran Chicago:
  - Habitantes aprox.: 5.500.000
  - Superficie : 2,250 km<sup>2</sup>

# Información General

- Población de Servicio: 5,5 millones
- Área Servida: 2.250 Km cuadrados
- Chicago más 125 municipalidades
- Tratamiento promedio de 1,5 billón gallons al día
- 7 Plantas de Tratamiento
- 886 Km de cloacas troncales 30 cm a 9 m
- 175 Km de túneles profundo TARP 3 m a 11 m
- Producción y Utilización de 150 mil toneladas de lodos biológicos al año
- Gerenciamiento de Aguas Pluviales 33 reservorios
- Presupuesto Anual: 1.400 Millones de dólares
- 2.186 Empleados

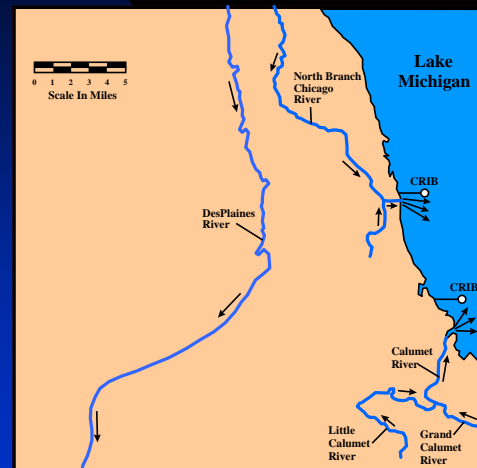




# Al comienzo del siglo 20; La solución a la contaminación era la dilución

## The Reversal of the Chicago River

Before



Before Construction of the Artificial Waterways

After

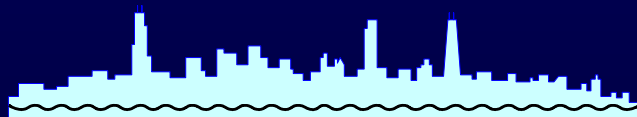


After Construction of the Artificial Waterways

5/25/2010

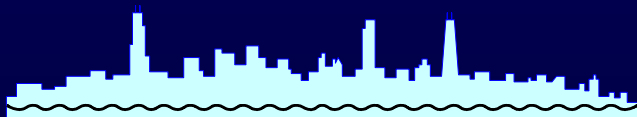
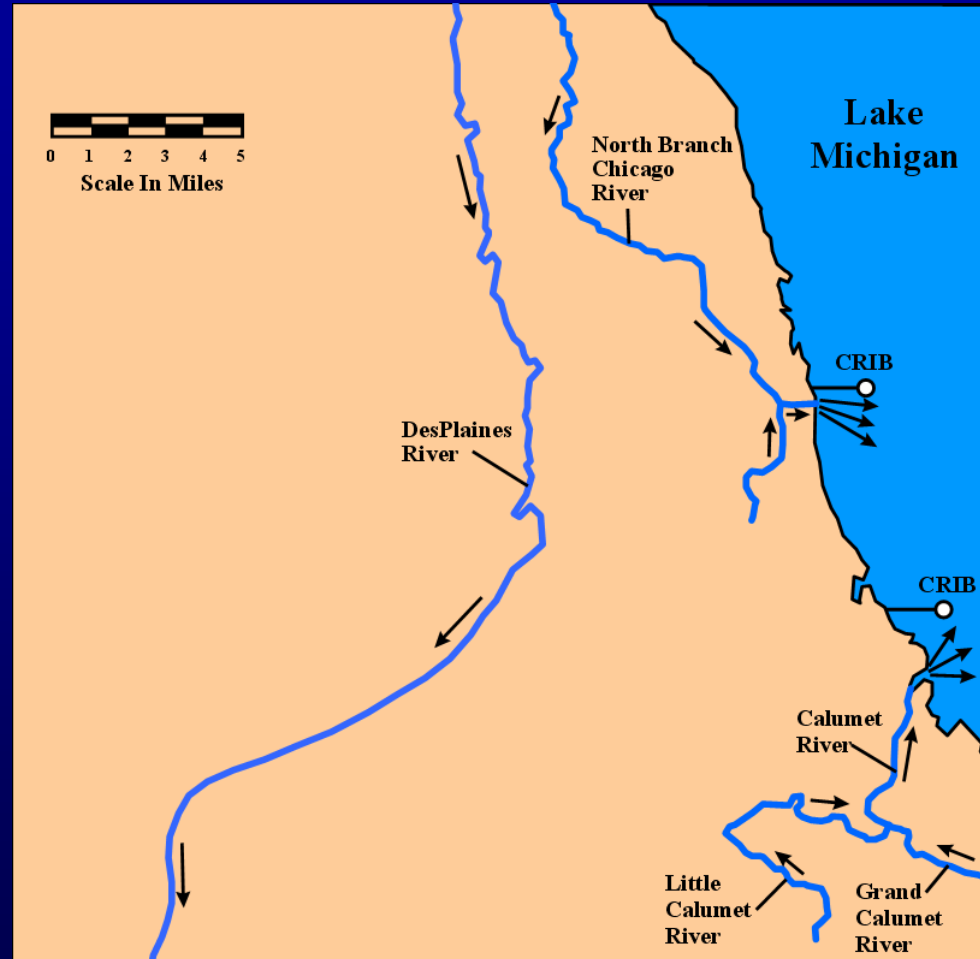
Presented By Sergio Serafino

5



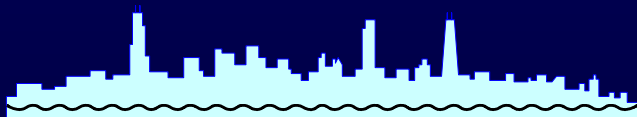
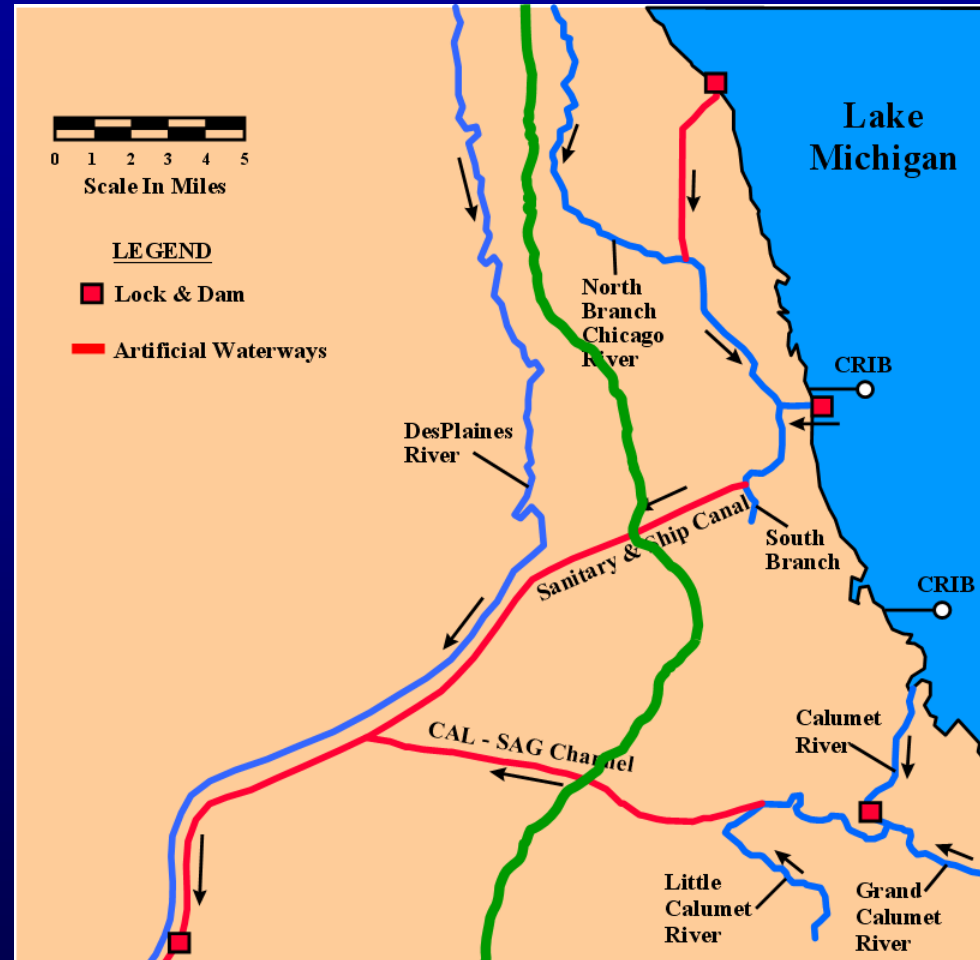
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# Condición Natural



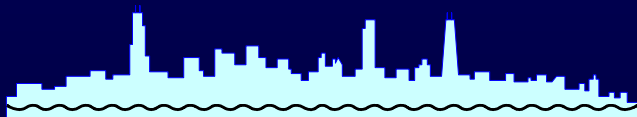
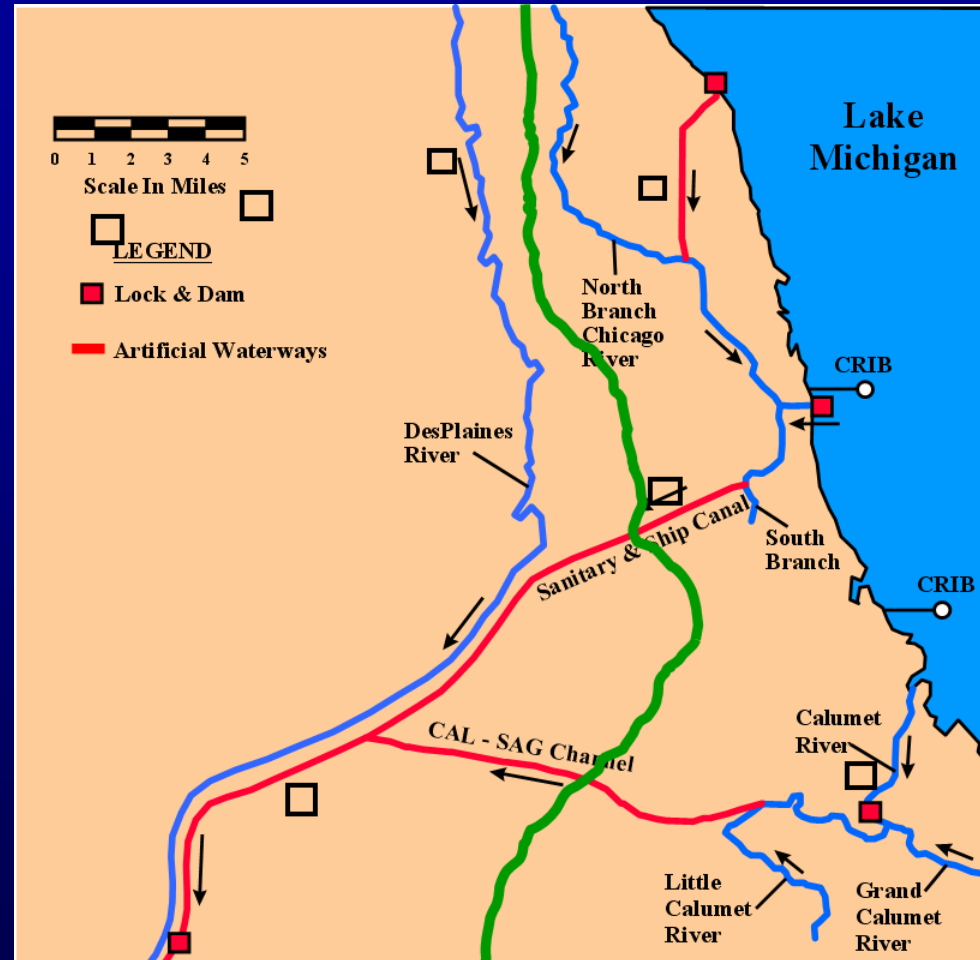
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# Construcción de canales



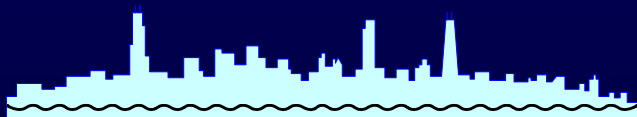
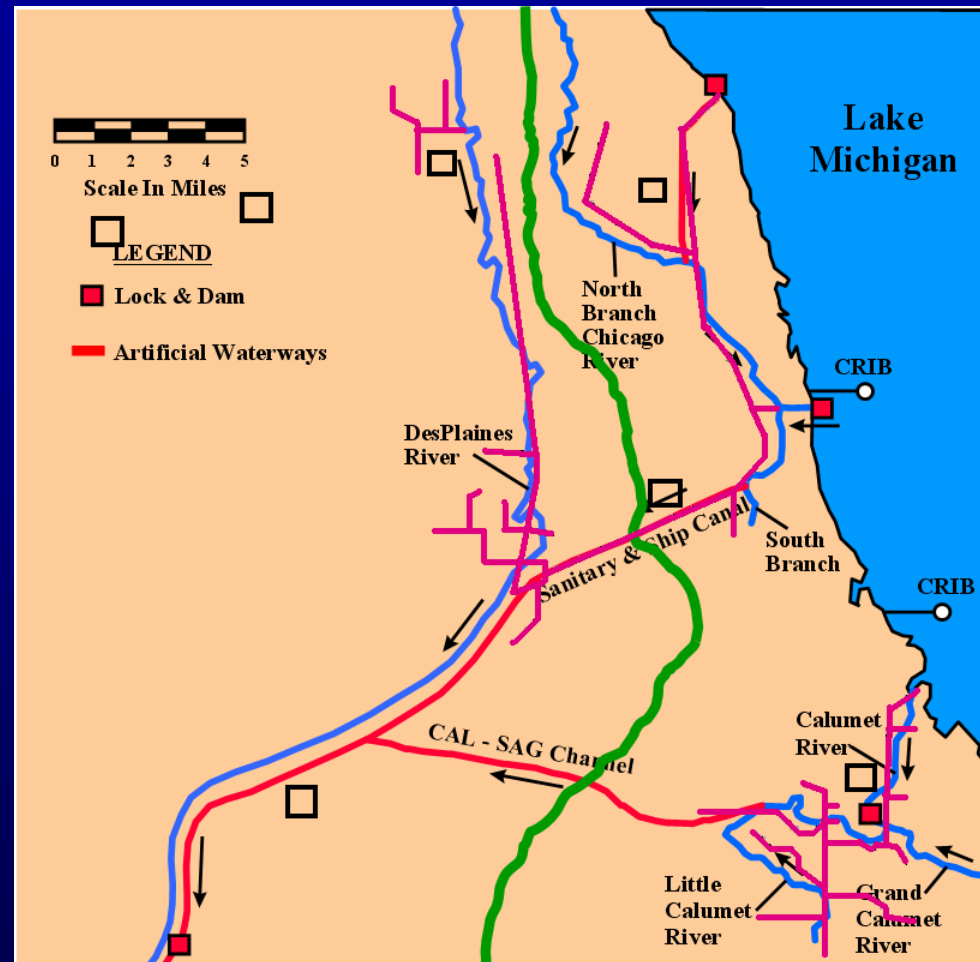
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# Construcción de Plantas de Tratamiento



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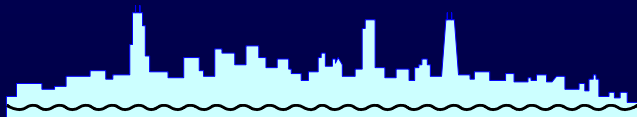
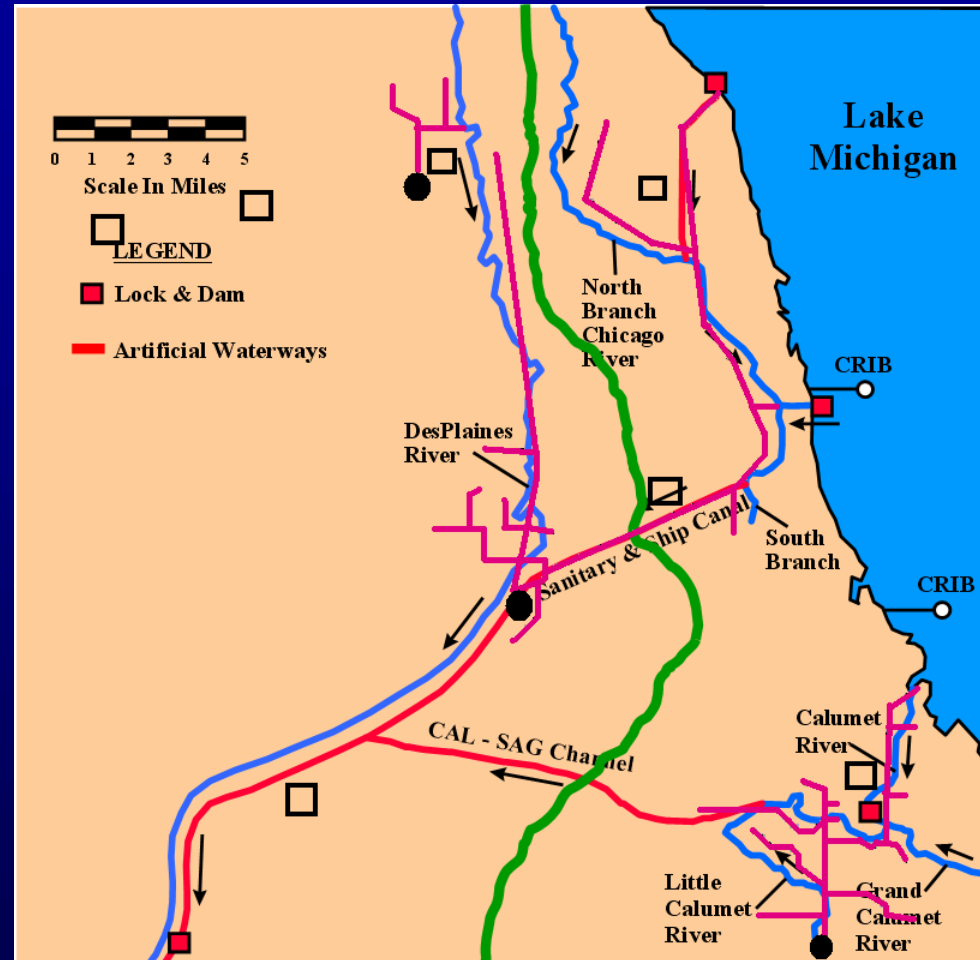
# Construcción Túnel Profundo



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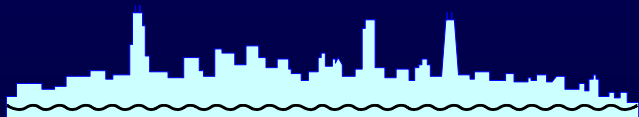
# Construcción de Reservorios



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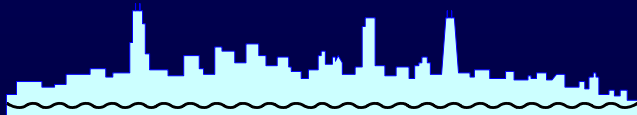
# Cronología

- 1889 se crea el Distrito
- 1900-22 se excavan canales y revierten los ríos
- 1922-39 se construyen plantas de tratamiento
- 1920-55 se construyen cloacas troncales para abastecer a las plantas
- 1975-2006 se construye el Túnel Profundo
- 1986-2026 se construyen los reservorios para el Túnel Profundo
- 2002-2040 Planes Maestros de Expansión de plantas



# Clean Water Act

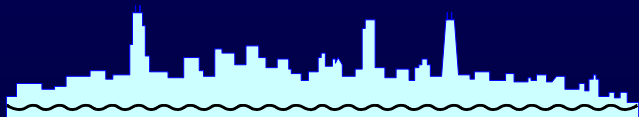
- In order to protect and maintain the water quality of the Nation's rivers, lakes, and oceans, the Clean Water Act was passed by Congress in 1972. The Clean Water Act (CWA) uses a variety of regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways.
- For this reason the EPA began to focus on a regulatory approach for wet weather point sources from urban storm sewer systems with the 1989 EPA CSO Controlling strategy. The goals of this strategy were:
  - to ensure that only wet weather CSOs occurred, if any
  - to bring all wet weather CSO discharge points into compliance with the technology-based and water quality based requirements of the Clean Water Act
  - to minimize the impacts of CSOs on water quality, human health, and aquatic wildlife.
- Then in 1994 the Combined Sewer Overflow Control Policy was created to further implement the 1989 EPA CSO Controlling strategy by providing guidance for the National Pollutant Discharge Elimination System (NPDES) authorities, State water quality standard authorities, and municipalities.
- The conditions specified within your permit are derived from the 1994 CSO Control Policy. The purpose of the Policy is to “*coordinate the planning, selection, design and implementation of CSO management practices and controls to meet the requirements of the CWA and to involve the public fully during the decision making process.*” The Policy specifies the implementation of the NMCs and the development of a Long Term Control Plan (LTCP).
- Both of these, the NMC and the LTCP are identified in your permits



NPDES

# Calidad de Efluente de la planta Stickney

Parámetro	Calidad de Efluente en 1970	Calidad de Efluente en 2009	Límite Permitido
Sólidos Suspendidos	29 ppm	5.8 ppm	<12 ppm
CBOD	18 ppm	3.3 ppm	<10 ppm
Amonia	11.4 ppm	0.56 ppm	<10 ppm (ver) < 5 ppm (inv)
Oxígeno Disuelto	7.1 ppm	7.6 ppm	> 6.0 ppm



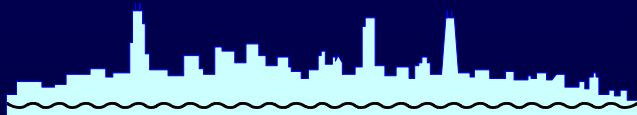


# 7 Water Reclamation Plants (WRP)



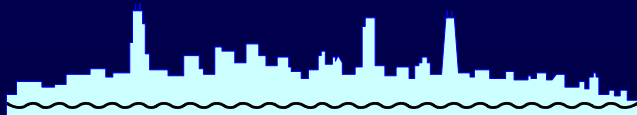
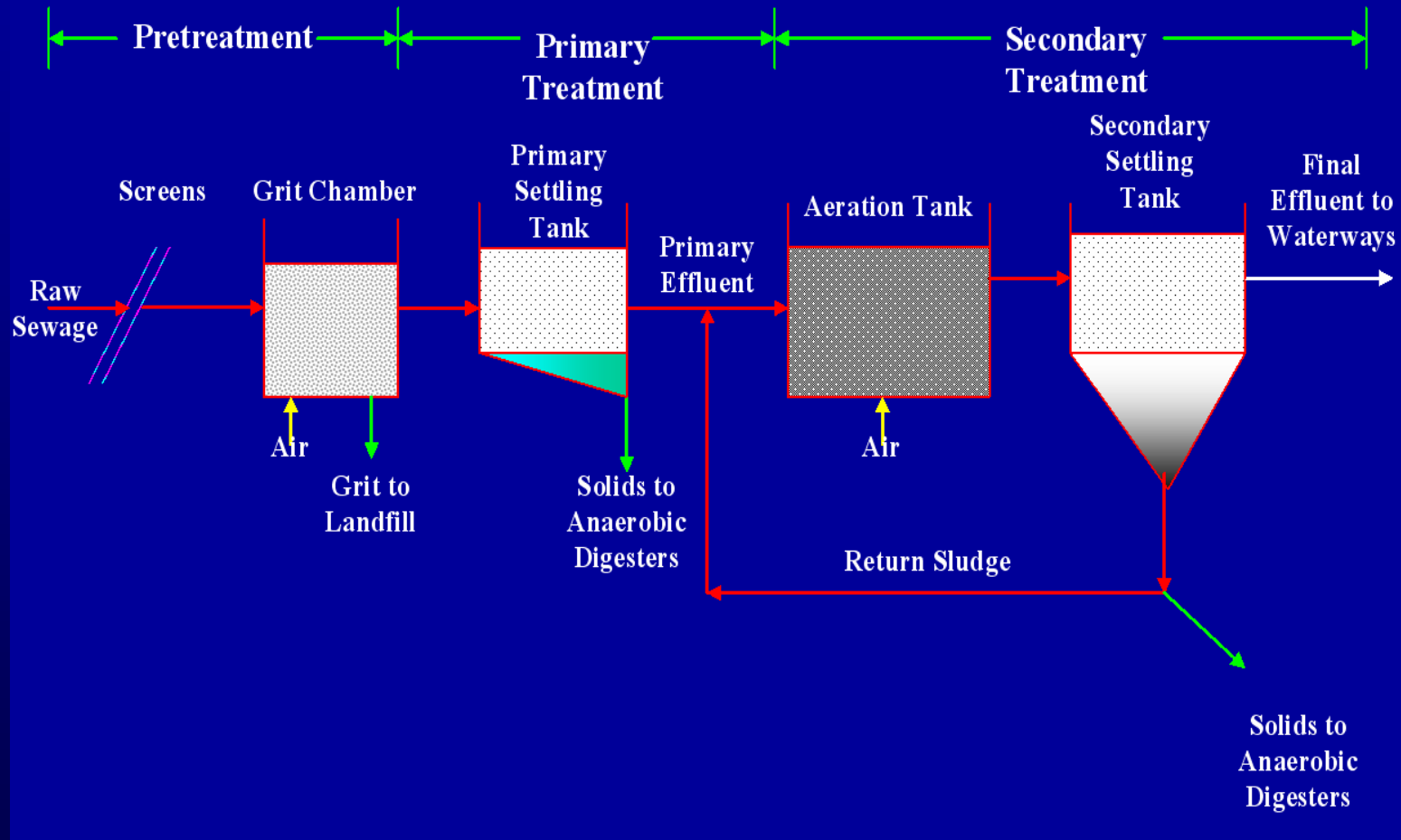
Capacidad de Diseño en  
metros cúbicos por día  
(cu. m/day):

Stickney	4,542,200
Calumet	1,339,890
North Side	1,260,405
Kirie	272,520
Egan	113,550
Hanover Park	45,420
Lemont	11,355



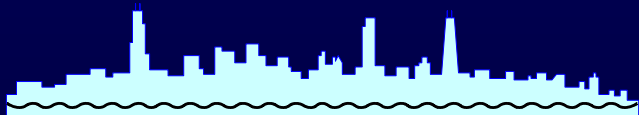
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# Tratamiento con Lodos Activados

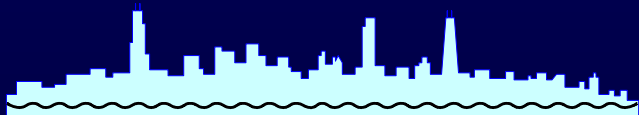


# Parámetros de Operación

- 0.9 cf air/gal de agua
- 0.5-1.0 F/M ratio
- 1800 -2600 mg/lt, licor mixto
- SRT = 10 días
- 50% lodos reciclados
- 7 a 14 horas de retención en planta



# Rejas, Tratamiento Preliminar

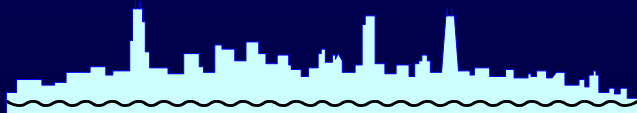


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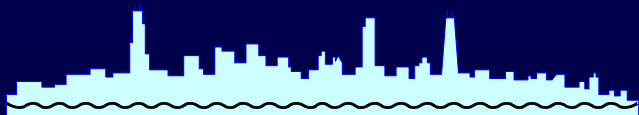


# Estación de Bombeo, Tratamiento Preliminar



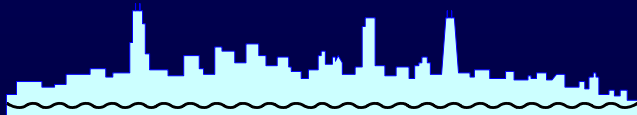
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# Estación de Bombeo, Tratamiento Preliminar



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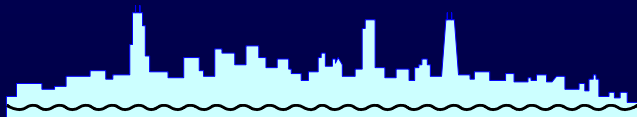
# Extracción de Arenas Tratamiento Preliminar



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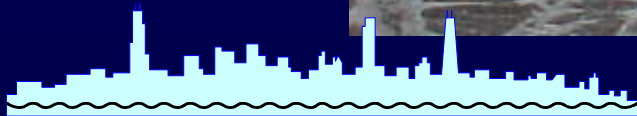


# Sedimentación Primaria



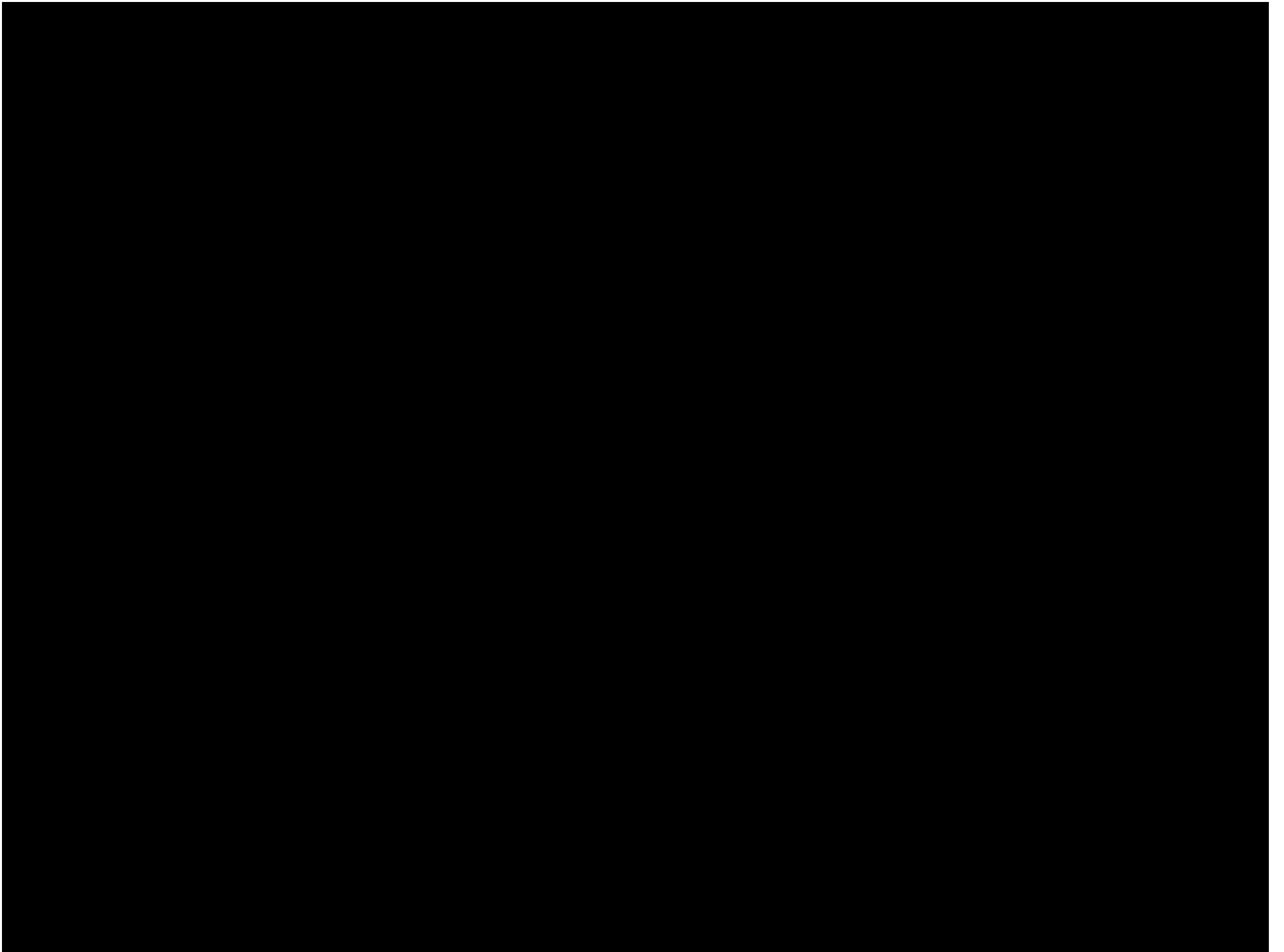
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# Lodos Activados, Tratamiento Secundario

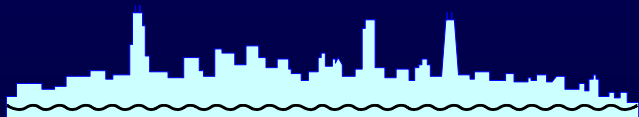


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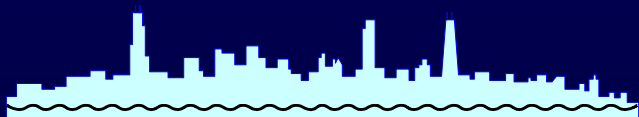




# Sedimentación Secundaria

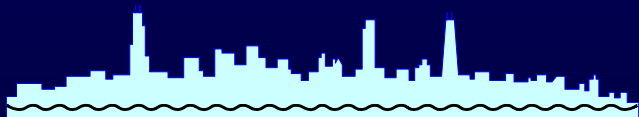


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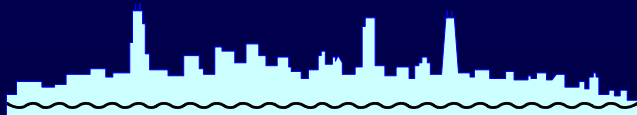
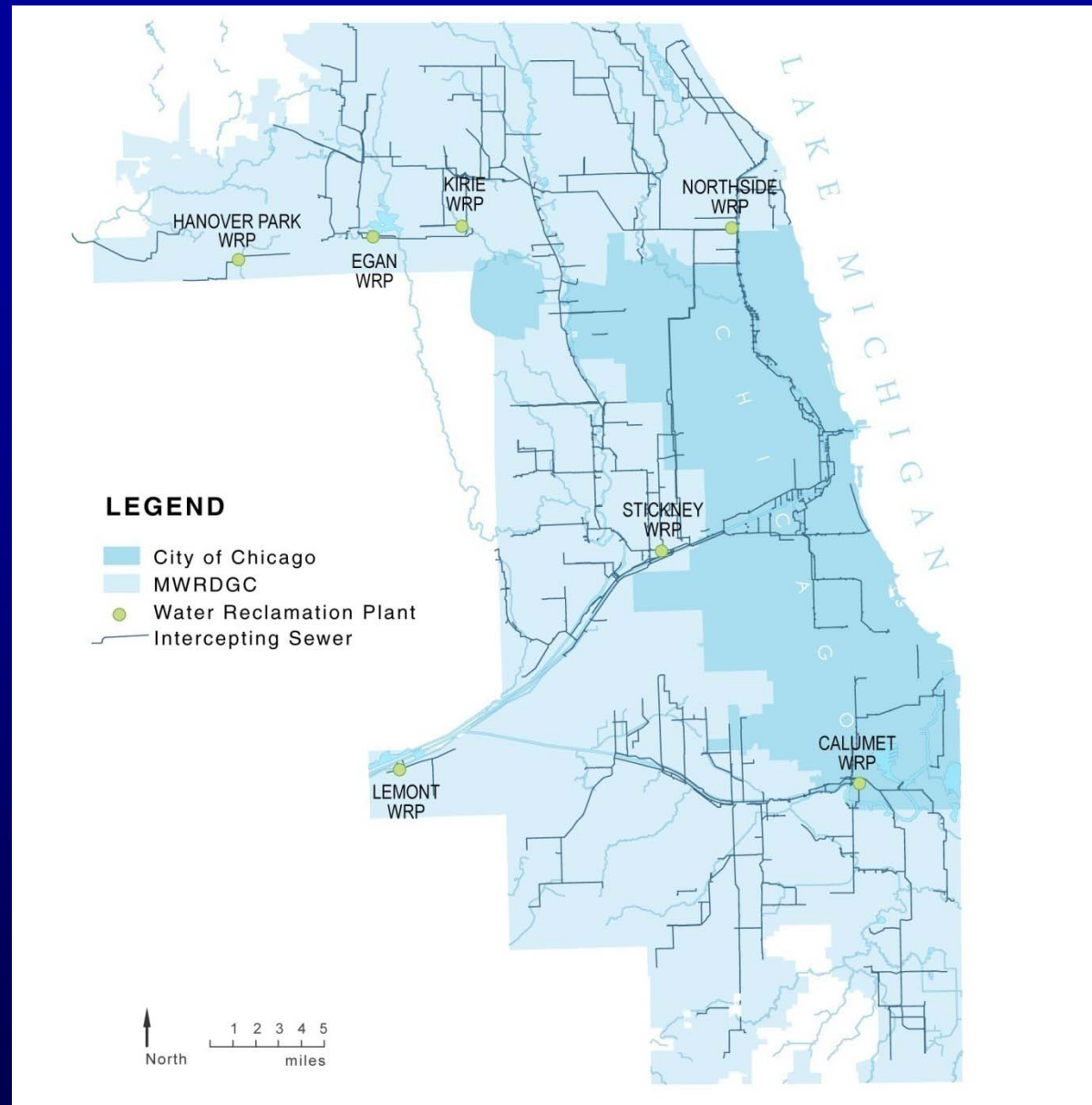
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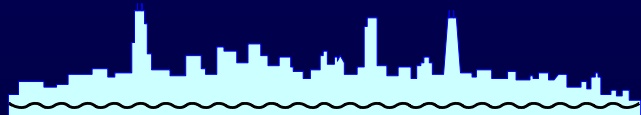


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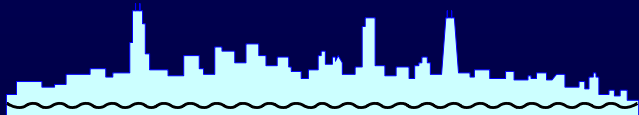
•886 kilometros de  
conductos cloacales  
troncales



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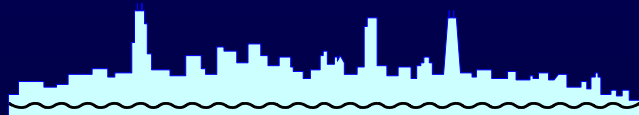
## Diapositiva 35

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s1

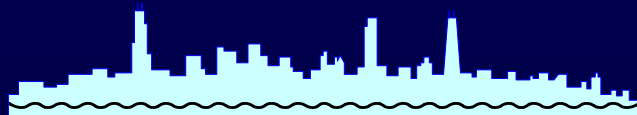
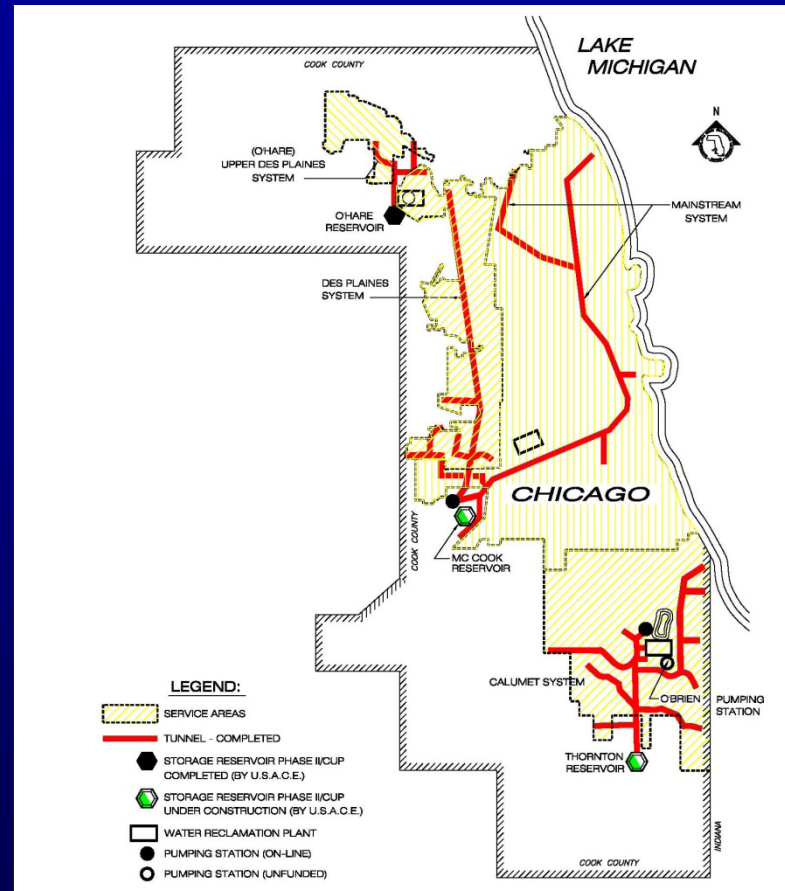
serafinos, 25/05/2010

# Métodos de Rehabilitación



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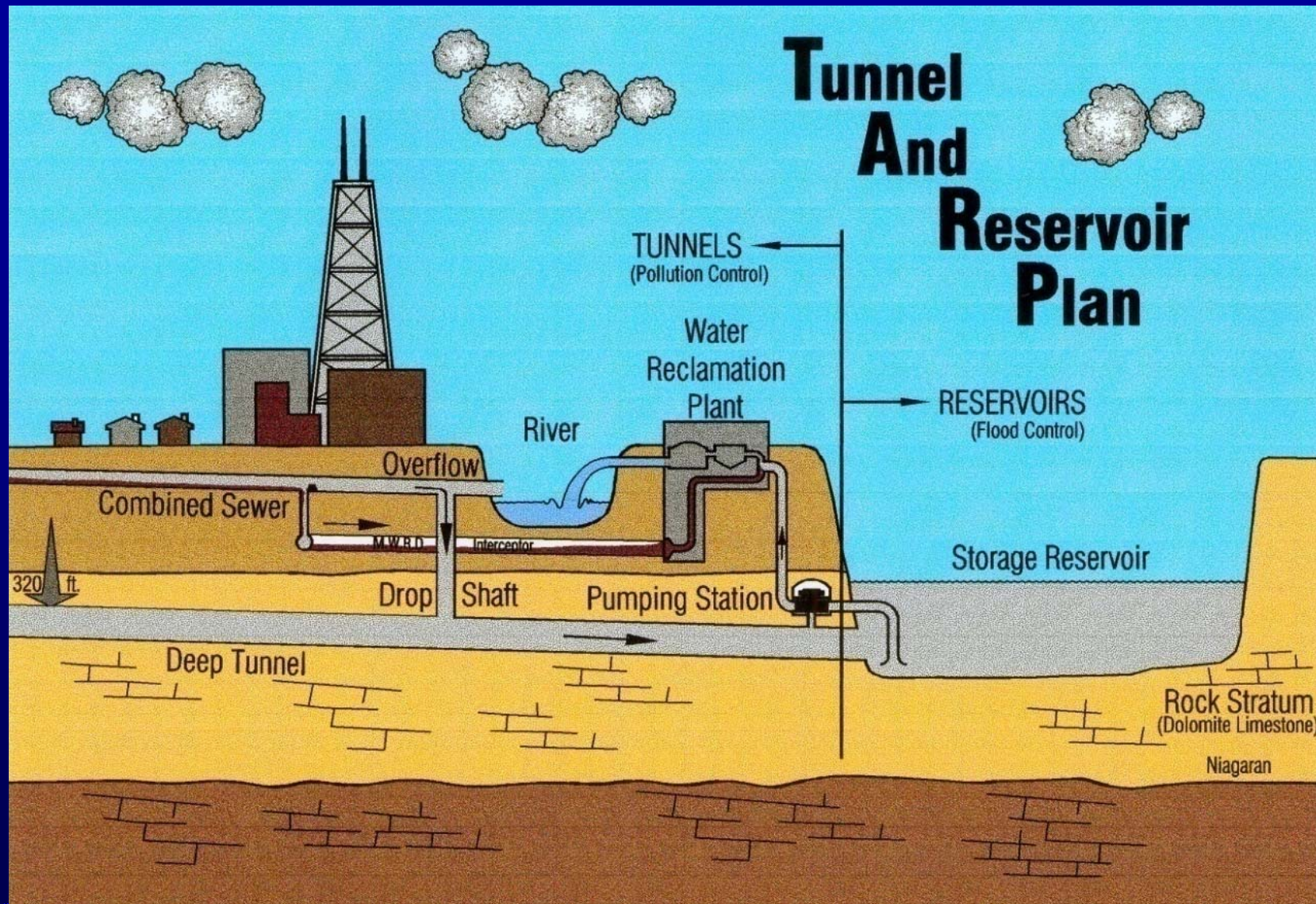
# Túnel Profundo



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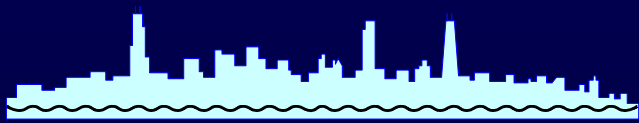
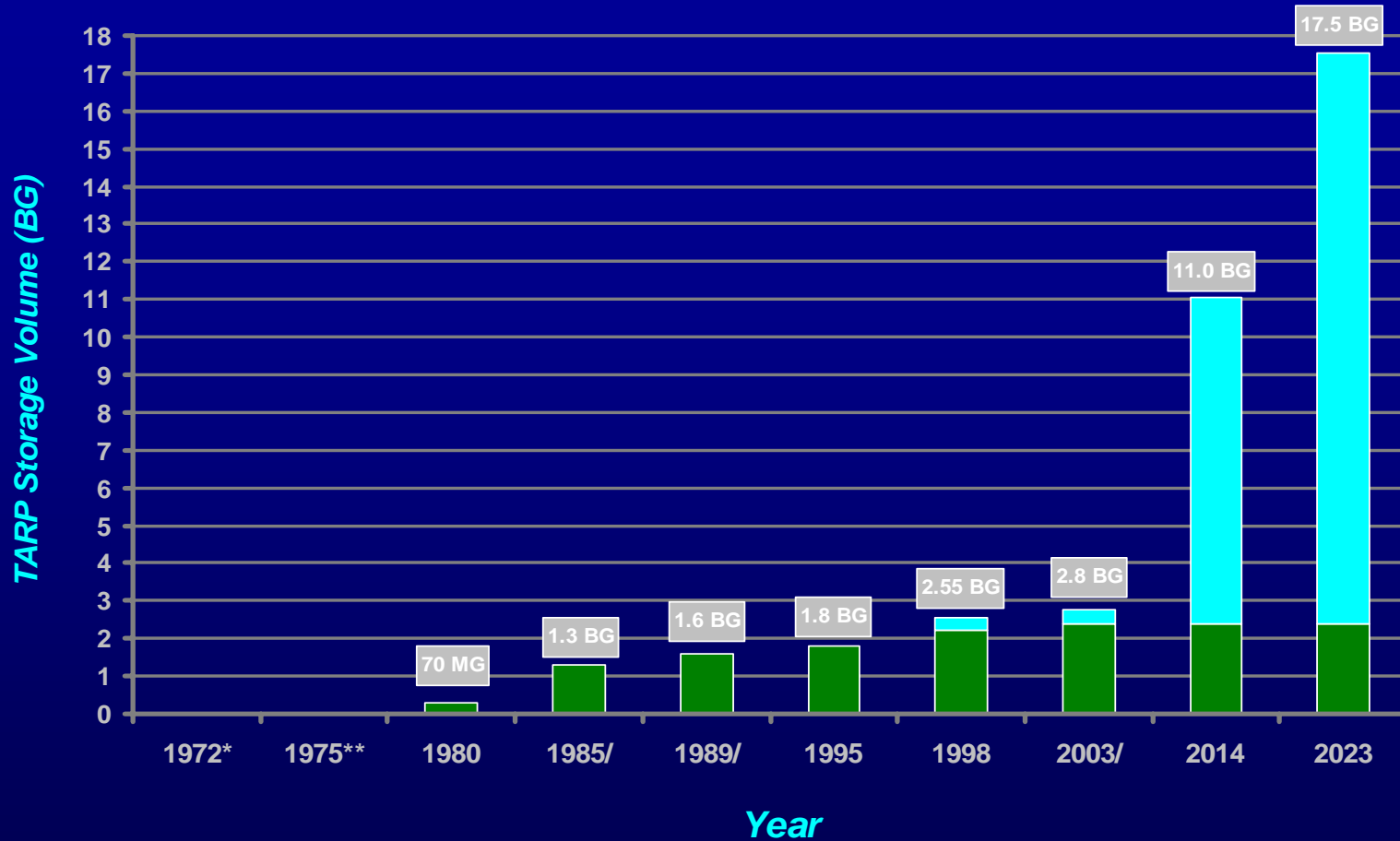


# Tunnel And Reservoir Plan



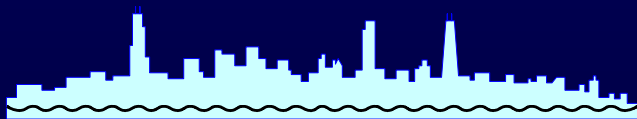
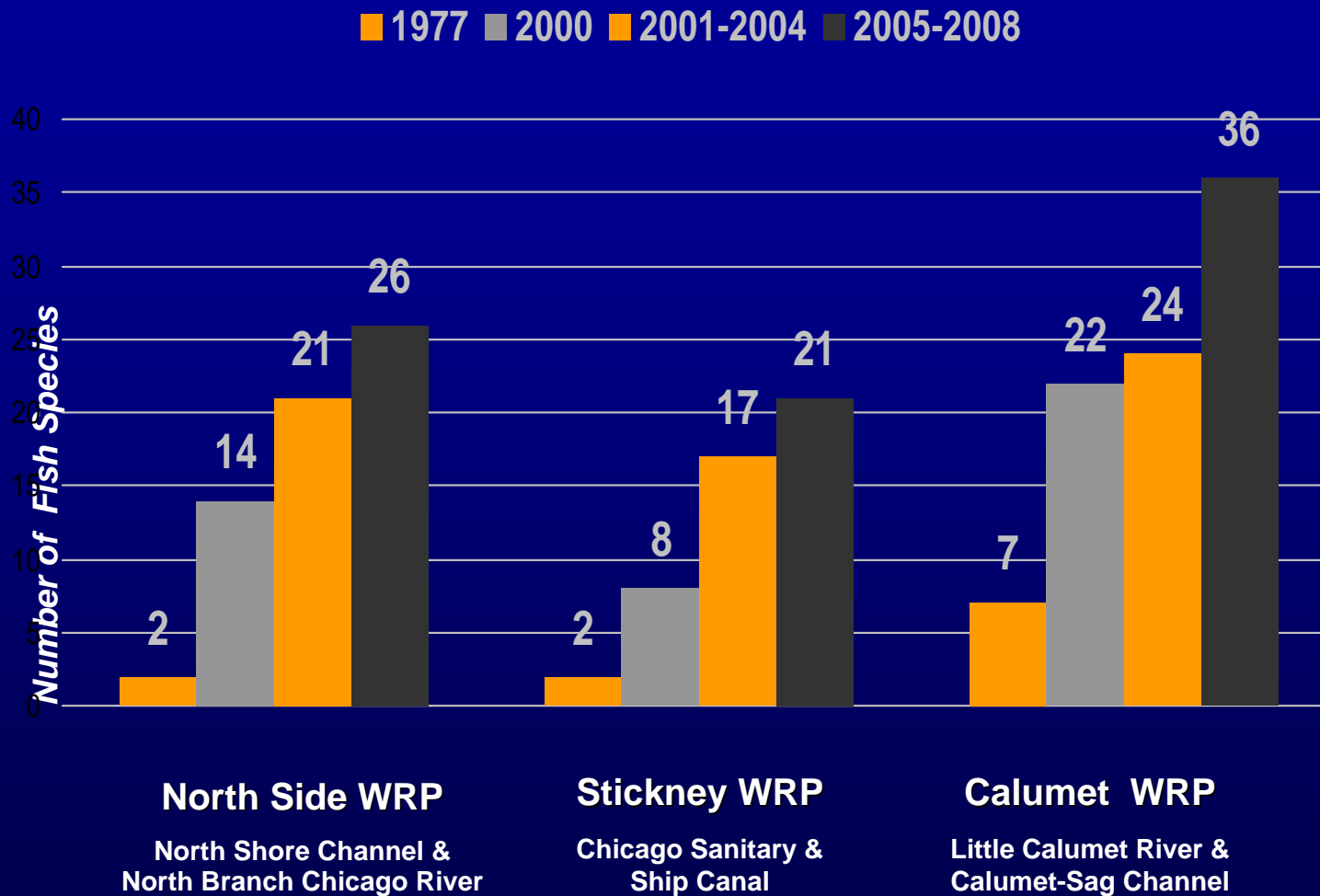
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# Volumen de Almacenaje Proyectado de TARP



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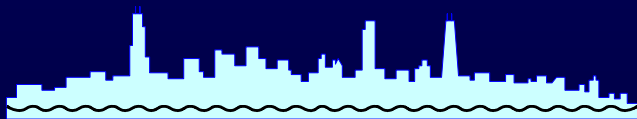
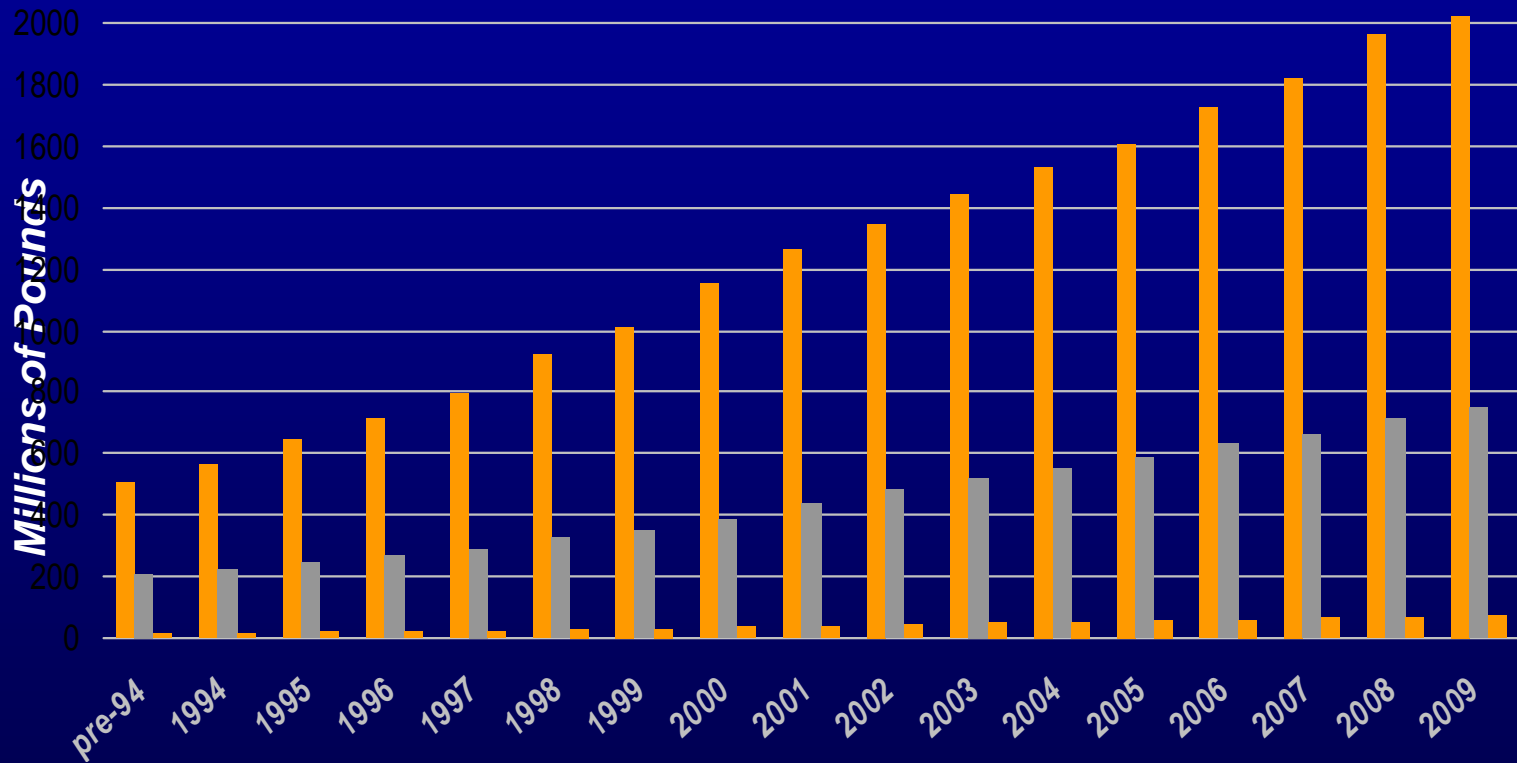
# Especies de peces en los canales



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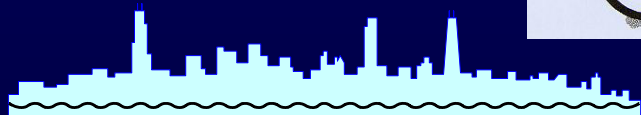
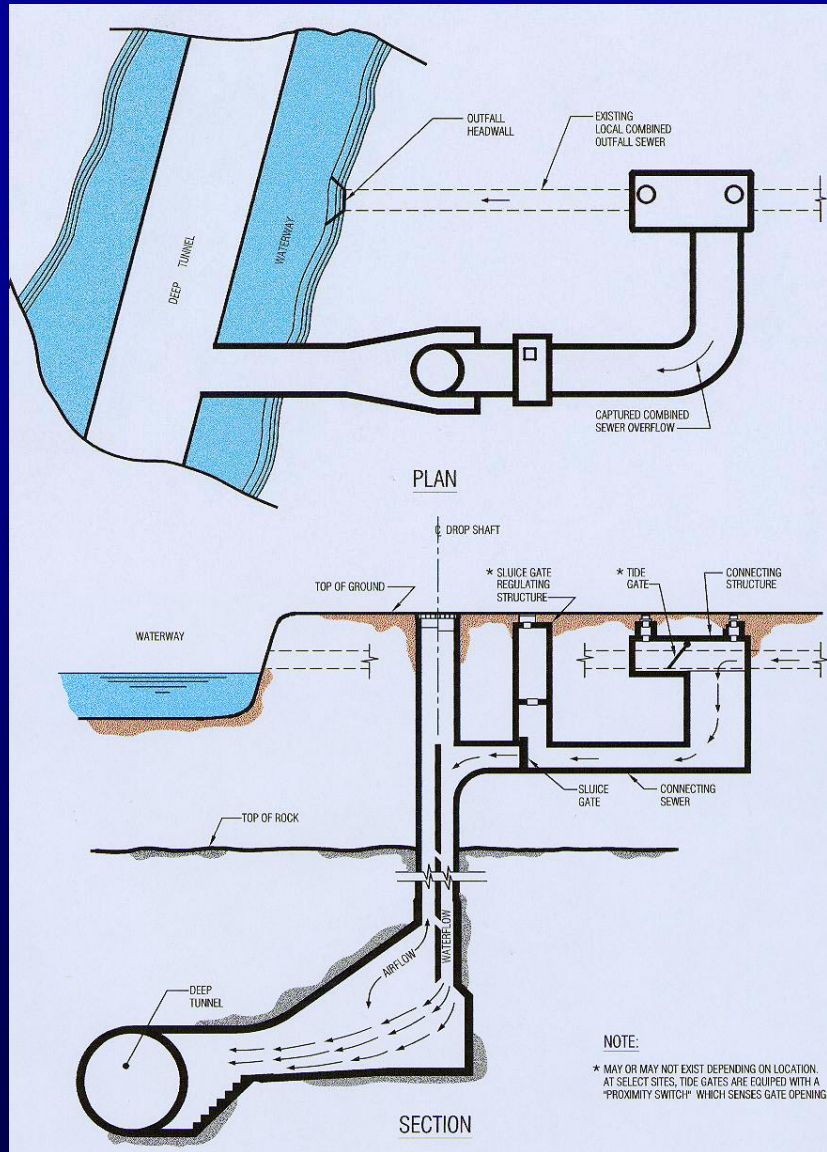
# Contaminantes Capturados

■ SS ■ CBOD ■ NH3-N



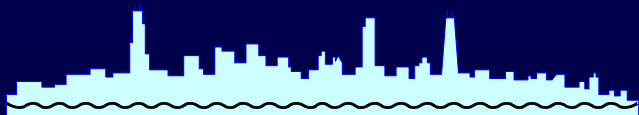
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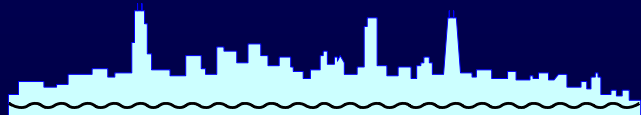


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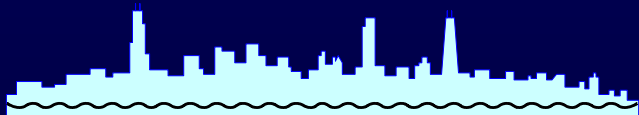
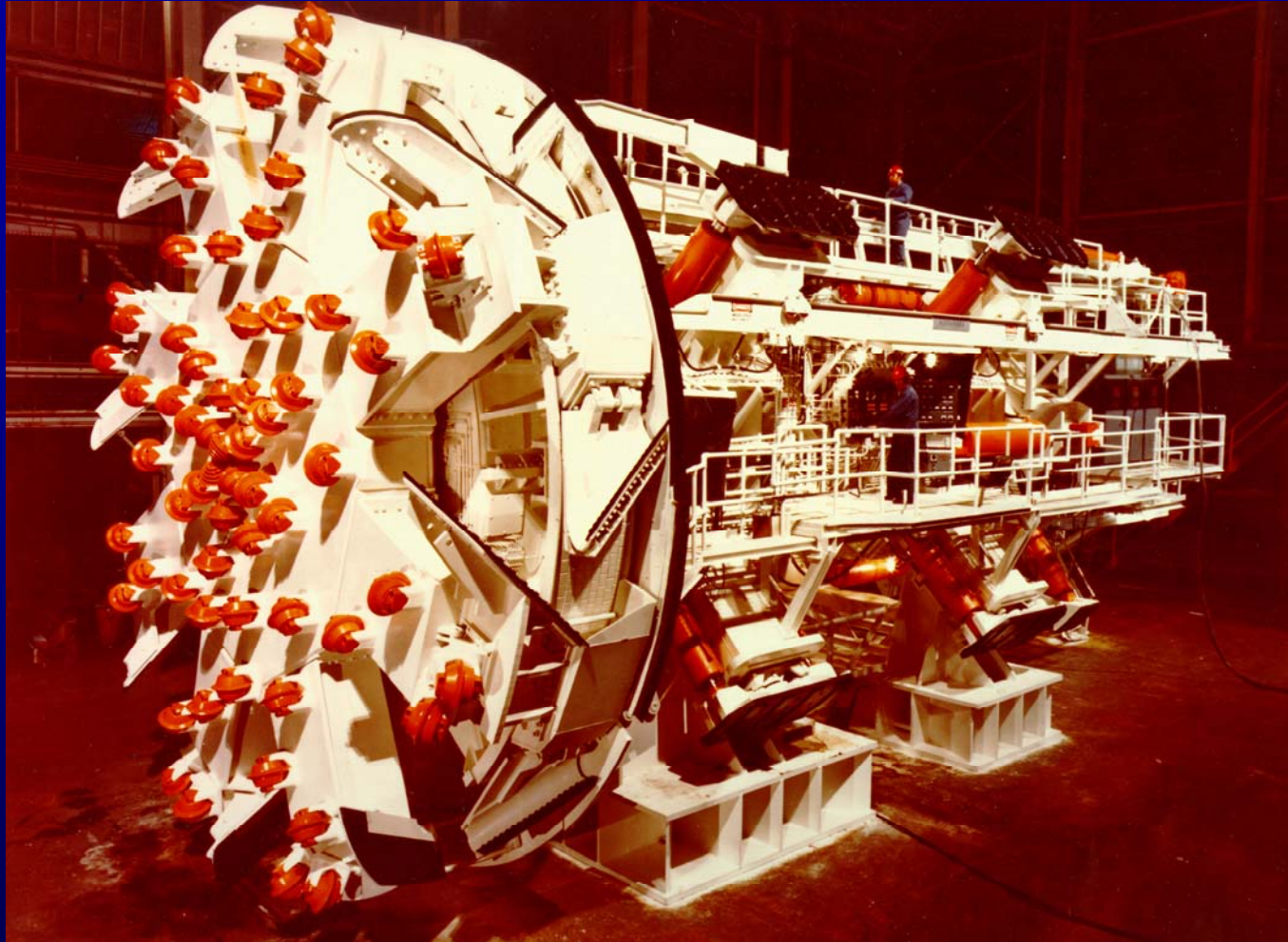
- Túnel Profundo
- 100 metros Profundidad
- 3 to 10 m. diámetro
- 175 km. long
- Captura de Aguas Pluvio-Cloacales Exedentes para el Control de Inundaciones y Contaminación





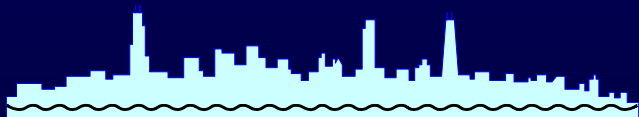


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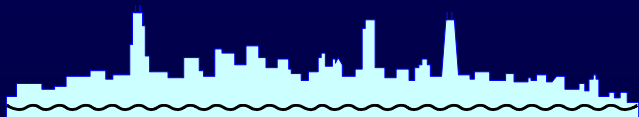
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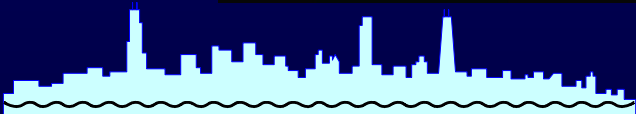
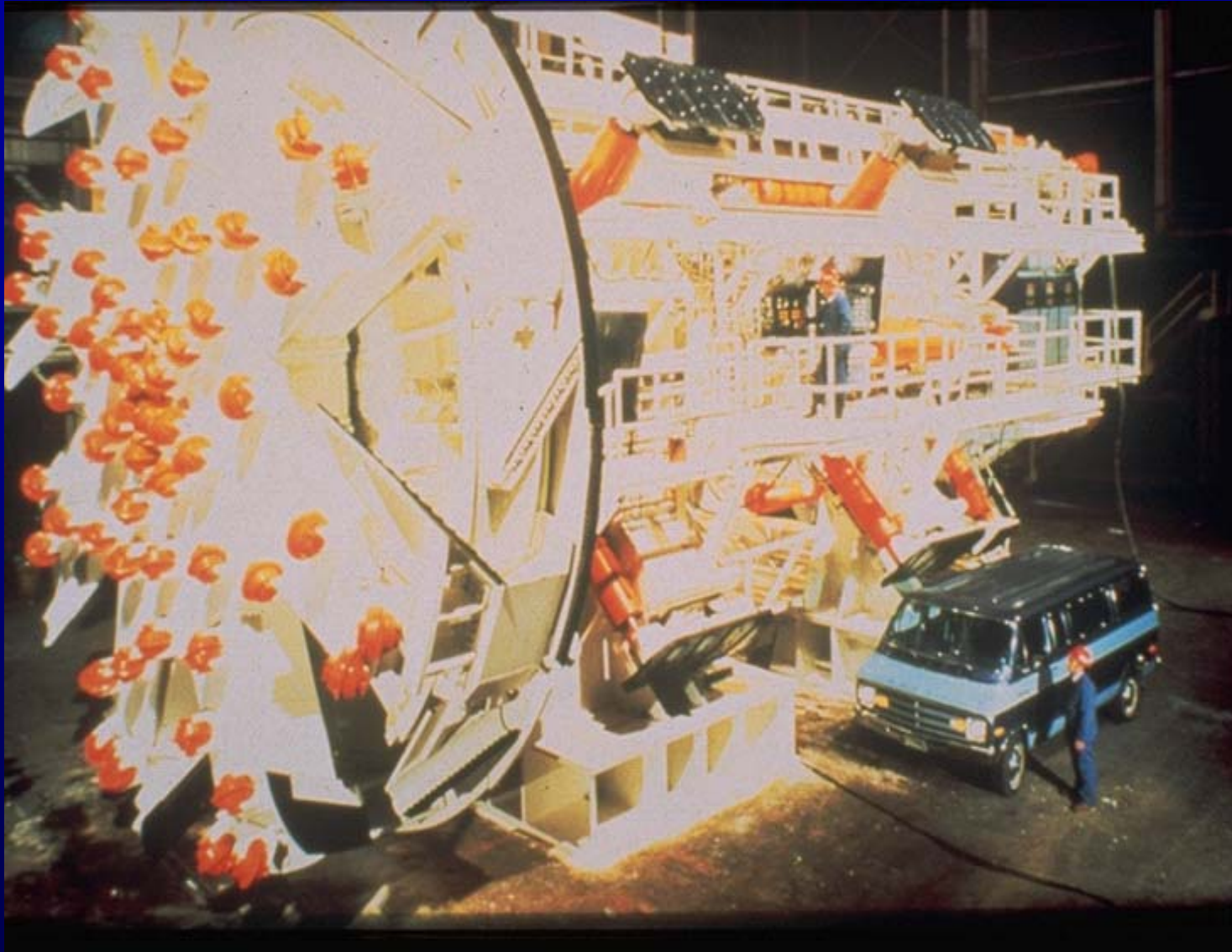




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- Drilling and blasting was not an option in a city environment
- engineering innovations, like significant advances in the use of tunnel boring machines (TBM).
- TBM were know since the 1850s but the machines were complicated, expensive and not very efficeint
- Robbins Equipment supplied many machines to different contractors including a 30' machine which at the time was the larger ever manufactured
- TBMs to dig similar tunnels in the US and Europe include the channel linking England and France
- the first construction contract awarded in 1975
- 2023 is the scheduled date for the last reservoir to come on line
- reservoirs are active quories



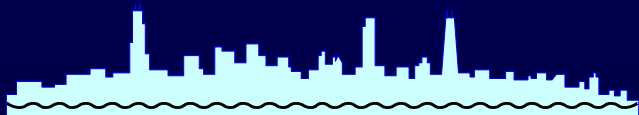


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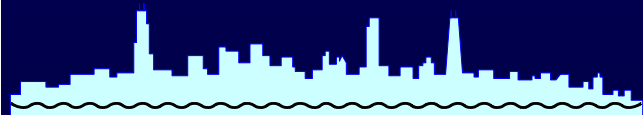






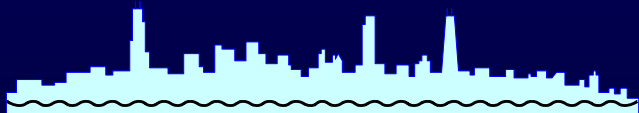


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# Transitional Reservoir



**Active Quarry**

**Tollway**



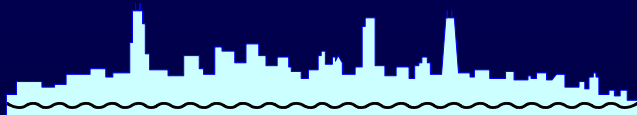
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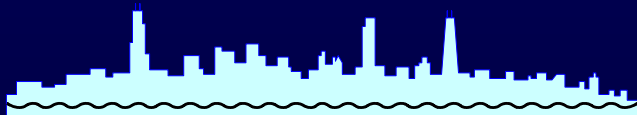
# Costo de TARP

Túneles.....	\$ 2.3 Billion
O'Hare CUP Reservorio.....	\$ 45 Million
Thornton Reservorio .....	\$420 Million
<u>McCook Reservorio .....</u>	<u>\$800 Million</u>
<b>Total TARP.....</b>	<b>\$3.6 Billion</b>

**Actualizado al presente, el costo sería de \$9.6 Billion**



- 109 miles of tunnel
- 9 to 33 feet diameter tunnels dug in limestone
- 200 to 355 feet below grade
- 250 drop shafts
- three dewatering PSs
- three reservoirs, one complete two under construction.
- Tunnels hold 2.4 billion gallons
- Reservoirs will hold 15 billion gallons
- 1981 the first tunnel is placed in service
- 2006, the last section of tunnel is completed
- 1986 the first of the reservoirs is placed in service
- 2023 is the scheduled date for the last reservoir to come on line
- Total estimated cost is 3.5 Billion \$ of which 630\$ Million are still to be spent



# Desarrollo de TARP

En 1965 se forma el Comité Para la Coordinación del Control de Inundaciones (FCCC) incluyendo:

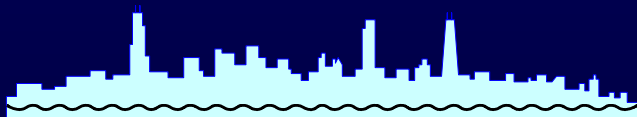
- Estado de Illinois
- Departamento Cook
- Ciudad de Chicago
- MWRDGC

Objetivo – Desarrollo de un plan comprensivo para el control y disminución de inundaciones y contaminación debido al excedente de flujos pluvio-cloacales

Mas de 50 Alternativas se desarrollan y 7 son Evaluadas durante 7 anos

TARP = Plan de Túneles y Reservorios es Seleccionado por FCCC y Adoptado por MWRDGC en 1972

USEPA otorga el primer préstamo de construcción para TARP en Julio de 1975

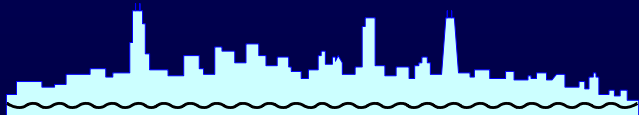


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## SEPA 5, Cal-Sag Channel, Chicago -USA

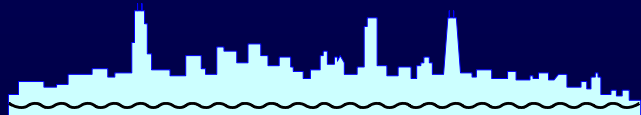


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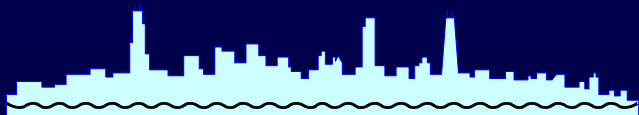
**Matanza-Riachuelo, Argentina.**



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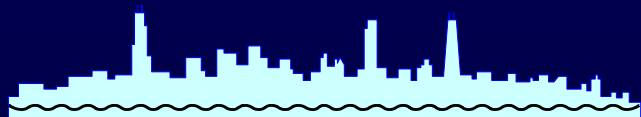


Gracias



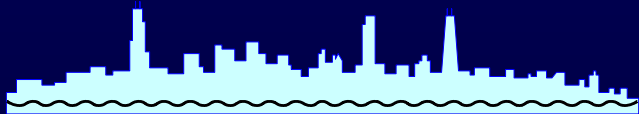
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# Thank You



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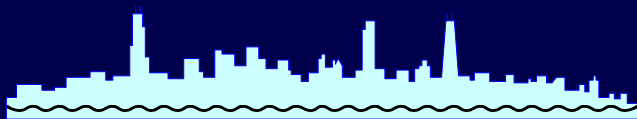


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# Nine Minimum Controls

1. Proper Operation and Regular Maintenance Programs for the Sewer System and CSO Outfalls.
2. Maximum Use of the Collection System for Storage.
3. Review and Modification of Pretreatment Requirements to Ensure that CSO Impacts are Minimized.
4. Maximization of Flow to the POTW for Treatment.
5. Elimination of CSOs during Dry Weather
6. Control of Solids and Floatable Materials in CSOs
7. Pollution Prevention Programs to Reduce Contaminants in CSOs
8. Public Notification to ensure that the Public Receives Adequate Notification of CSO occurrences and CSO impacts.
9. Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls.





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