From:	Finnell, Emily (DEQ)
To:	mi-waterstrategy
Subject:	FW: Water Strategy Comments from Saginaw Chippewa Tribe
Date:	Tuesday, March 08, 2016 11:29:56 AM
Attachments:	09212015MOGL Water Strategy Comments w signature.pdf 09212015 MOGL Water Strategy Comments Table.pdf

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From: Carey Pauquette [mailto:CPauquette@sagchip.org]
Sent: Monday, September 21, 2015 10:23 AM
To: Allan, Jon (DEQ); Finnell, Emily (DEQ)
Cc: Goodheart, James (DEQ); Copen, Leigh (DEQ)
Subject: Water Strategy Comments from Saginaw Chippewa Tribe

Hello,

Attached you will find comments and a cover letter from the Saginaw Chippewa Indian Tribe of Michigan regarding the Office of Great Lakes Water Strategy. The SCIT is excited to partner with the State as we move ahead implementing our strategies as collaborators. Outlined you will find a comparable task list the Tribe intends to embark on relating to the Strategy. We look forward to hearing from you. Please feel free to contact me for more information or details on the attached comments.

Sincerely,

Carey Pauquette
Water Quality Specialist
Saginaw Chippewa Indian Tribe of Michigan
(989)775-4016

The Saginaw Chippewa Indian Tribe Of Michigan

TRIBAL CHIEF

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Office of the Great Lakes
DEQ
P.O. Box 30473-7973
Lansing, Michigan 48909
August 24, 2015

RE: Saginaw Chippewa Indian Tribe Comments on the Office of Great Lakes Water Strategy

To Whom It May Concern:

The Saginaw Chippewa Indian Tribe of Michigan (SCITM) would like to thank the Office of Great Lakes for the consultation and comment opportunity regarding the Office of Great Lakes Water Strategy. Implementation of the Water Strategy is in the best interest of current and future generations. SCITM is committed to protection, stewardship, and restoration of our water resources. Water represents a cultural cornerstone for our community, along with being essential to sustain life. Traditional Lifeway's including fishing, hunting, gathering, conducting ceremonies, and other cultural practices are dependent on clean water resources. Attached you will find comments regarding potential involvement by SCITM to collaborate and partner in the implementation of the Water Strategy.

Sincerely,

Steven Pego, Tribal Chief
Saginaw Chippewa Indian Tribe

The Saginaw Chippewa Indian Tribe of Michigan is providing the following comments and explanation of potential collaborations through the implementation of the Office of Great Lakes, Water Strategy.

The following table is amended from 2015 Office of the Great Lakes Draft Water Strategy Table 2. Water Strategy Implementation Plan. The Saginaw Chippewa Indian Tribe of Michigan has added the column providing information on the potential involvement of SCITM in the implementation of the Strategy.

Goal 1: Michigan's aquatic ecosystems are healthy and functional.				
Outcome: Aquatic ecosystems are resilient and diverse.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Potential Involvement SCITM**
1	Prevent the introduction of new aquatic invasive species and control existing populations of aquatic invasive species in accordance with the Michigan Aquatic Invasive Species Management Plan.	By 2020, the ecological separation of the Great Lakes basin and the Mississippi River basin, especially in the Chicago Area Waterways system has been initiated.	State and federal agencies, nongovernmental organizations (NGOs), local units of governments, individuals.	• *Planning, design, and implementation of a boat wash at Eagle Bay Marina.* • *Add green infrastructure language to construction RFP language as a mandatory consideration in all planning and designs.*
2	Work with other Great Lakes states and provinces to harmonize aquatic invasive species prevention, early detection processes and response actions across the Great Lakes region.	By 2016, implement a pilot project with Ontario and interested states to evaluate and pursue areas of harmonization.	State agencies	
3	Accelerate research and solutions to identify mechanisms of food web disruption and changes of nutrient flows in the Great Lakes with a focus on the effects of invasive species.	By 2017, a minimum of three new research projects will be established for the purposes of evaluating nutrient shifts in Great Lakes food webs to help focus appropriate management, social, and economic responses.	Universities	*Continue and promote research partnerships with the Universities in the Saginaw Bay to identify and resolve issues.*

4	Develop a comprehensive strategy to prevent nuisance and harmful algal blooms.	By 2017, develop a strategy to prevent harmful algal blooms and HABs based on desired outcomes.	MDEQ, local public health departments	• *Reduce nutrient application to Tribal Properties.* • *Develop program to reduce failing septic systems.*
5	Achieve a 40% phosphorus reduction in western Lake Erie basin.	Pending finalization and/or agreement with Annex 4 Water Quality Workgroup.	MDEQ, MDARD	
6	Develop harmful algal toxin water quality criteria and implement a real-time monitoring strategy for Michigan's Great Lakes drinking water intakes and public recreation locations threatened by harmful algae.	By 2020, increase by 20% the number of people served by drinking water suppliers using surface water sources with real-time monitoring equipment installed to provide early warning of potential public health threats. By 2020, develop harmful algal toxin assessment criteria. By 2020, implement a real-time monitoring strategy for Michigan's Great Lakes drinking water intakes and public recreation locations threatened by HABs.	MDEQ	*Develop Tribal Monitoring Strategy to include harmful algal toxin water quality criteria for implementation for Tribal source and surface water.*
7	Support the development of a national drinking water advisory or action level target for harmful algal toxins.	Work with federal agencies to develop a national advisory target.	MDEQ	
8	Incorporate planning for wet weather extremes and increased variability into state, regional, and community planning.	Best management practices are reviewed every five years and updated (if necessary) to reflect climatic changes such as changes in rainfall frequency, duration or intensity.	State, regional governmental entities, communities	• *Collaborate with County Drain Commissioners to manage wet weather events within Tribal Boundary and on Tribal Property.* • *Work with landowners impacting Tribal Waters to develop a strategy to reduce flooding and high flow.*

9	Provide technical assistance and develop technical tools and training programs for communities, local officials and water stakeholders to inform and improve their water literacy and help them integrate water impacts into local land-use planning and decisions.	By 2020, develop a public official water literacy measurement. By 2020, develop a training module for local elected officials and decision-makers on the connection between land-use planning and zoning and the siting and approval of new projects. By 2020, develop a training module for local elected officials and decision-makers on the merits and benefits of asset management planning.	Universities, regional government and planning organizations, MDEQ	• *Continue annual presentation updating Tribal Council on Water Quality issues being identified and addressed.* • *Continue outreach efforts to local municipalities regarding water quality program.* • *Develop training for local decision makers such as Drain Commissioners and other water quantity managers impacting Tribal surface water.*
10	Develop tools and guidance related to shoreline and riparian ecology and management and provide necessary technical support and training to municipalities, watershed-based organizations and landowners to achieve full benefits of riparian areas.	By 2020, develop a baseline for the current research and educational capacities. • Coordinate to pinpoint areas of capacity expansion. • Develop tools, guidance and training on best practices. • Determine need to update guidance and training materials.	MDNR, MDEQ	*Continue working with collaborating agencies, organizations, and community members to provide updated information on implementing best management practices within Tribal watersheds.*
11	Remove or improve dams that are no longer safe or ecologically, economically, or socially viable to protect public safety and create healthy, connected aquatic systems.	By 2020, address all dams most at risk of failure.	MDEQ, MDNR	
12	Focus river and stream restoration efforts on addressing small hydrological impediments like culverts to create connectivity and restore stream stability.	By 2020, increase the number of small hydrologic impediments that are restored over a baseline established in 2015.	NGOs and local units of governments	*Establish updated design criteria on all new structures that may impede or reduce natural flow, fish and wildlife accessibility, etc. impacting Tribal Water Resources.*

13	Refine and improve the water withdrawal assessment process to ensure sustainable use of water resources and that high priority is given to incorporating existing and new data and models to better represent local and regional water resources and surface water / groundwater interactions.	By 2016, develop a list of priority Water Use Advisory Council recommendations and an implementation plan.	MDEQ, MDNR, MDARD	
14	Provide technical and financial support to communities to plan and implement green infrastructure techniques and low-impact development while preserving natural spaces in the design of new developments, redevelopments and road projects to ensure storm water management and improve hydrology.	By 2020, increase the number of attendees to green infrastructure conferences, applications for projects, amount of grant dollars awarded to projects incorporating green infrastructure or low-impact development, and number of programs incentivizing green infrastructure projects and the number of Michigan communities that are recognized for green infrastructure projects and strategies over a baseline established in 2015.	MDEQ, MDOT, MDNR, Michigan State Housing Development Authority, MEDC	• *Update Tribal Codes to include green infrastructure practices.* • *Work with local agencies to establish low-impact development and green infrastructure incentivizing programs through to secure sustainable stormwater management practices.*
15	Modernize road and highway planning and infrastructure to effectively accommodate storm water runoff and infiltration needs, thereby reducing the costs and impacts of flooding.	By 2020, increase the number of Michigan's new road and highway projects designed to better accommodate storm water runoff and infiltration needs over a baseline established in 2015.	MDOT, local road and highway commissions	
16	Enhance financial and technical support of local stakeholder efforts to develop and implement watershed management plans to restore impaired waters, protect high quality waters, and develop and utilize local water resource assets.	By 2018, increase the number of grants, training and educational opportunities on the development and implementation of watershed management plans over a baseline established in 2015.	MDEQ	*Work with collaborating agencies to develop watershed management plans on impaired Tribal waters.*

17	Use existing authority to work with local units of government with storm water discharge or storm water-related hydrologic impairments in their waterways to establish Phase II storm water plans for impaired water bodies.	By 2020, increase the number of water bodies with storm water plans in place to address designated use impairments caused by storm water discharges and hydrologic impairments over a baseline established in 2015.	MDEQ, MDNR	
18	Eliminate impairments in priority watersheds that have degraded water quality and/or aquatic ecosystems due to nutrient runoff and soil erosion. Engage landowners through a collaborative and adaptive community-based natural resource management process to identify local actions to change behaviors and solution to achieve those outcomes. Failure to achieve demonstrable outcomes within established timeframes could trigger additional measures.	Agricultural land-use will directly follow MAEAP guidelines and participation criteria to remain consistent with the state's recent efforts. Concurrently develop the escalated "additional actions" triggered once a watershed has been determined to be impaired. By 2018, develop regional action teams with protocols for working with landowners. Educate collaborative teams on existing regulations and enforcement mechanisms allowed in their regions. By 2020, collaborative processes are in place with plans to achieve water quality outcomes in priority watersheds.	MDEQ, MDARD	• *Continue efforts with local agricultural community to reduce farming impacts to water quality on impaired waters.* • *Continue efforts with collaborating agencies to reduce impact of failing and antiquated septic systems on impaired waters.*
Goal 2: Michigan's water resources are clean and safe.				
Outcome: Surface and groundwater are managed to support sustainable human uses and ecological function.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Potential Involvement SCITM**

1	Protect drinking and source water areas by: • Continuing to ensure remediation activities address the long-term impact on drinking water sources. • Identifying and diligently protecting source water protection areas. • Assisting well owners with identifying potential water well vulnerabilities. • Focusing resources on contamination sources with the highest potential for causing contamination of drinking water supplies, including chemical storage facilities. • Enhancing the drinking water geographic information system database and making information available across MDEQ programs and to local public health department environmental health personnel. • Supporting mapping of local groundwater conditions in partnership with well contractors and others who collect groundwater information.	By 2020, address IT security issues, such as firewall and server capacity, to make information publically available. By 2020, develop educational materials to encourage residents with private drinking water wells to test new wells prior to use for nitrates and arsenic and to test wells prior to sale or transfer for bacteria, nitrates, and arsenic. By 2020, develop an interface to effectively and efficiently track and monitor for groundwater contamination, and implement data tracking.	MDEQ, Local health departments.	*Continue to support the Abandoned Well Closure Program through the Isabella Conservation District to protect groundwater.*
2	Develop a plan for aquifer protection that addresses geothermal construction and proper abandonment of wells.	By 2016, convene a stakeholder work group to develop draft legislation to regulate closed-loop geothermal construction. By 2020, develop educational materials for community land-use water systems and local health departments to increase plugging rates of abandoned wells when	MDEQ	*Continue to support efforts of Isabella Conservation District through the Abandoned Well Closure Program.*

		municipal water mains are extended.		
3	Establish inspection requirements for residential wells, including testing wells for nitrates, bacteria, and arsenic.	By 2020, implement a statewide requirement for periodic inspections of drinking water quality.	Legislature	*Work with local agencies to develop programs for point of sale inspections and evaluation.*
4	Develop a spill and communication strategy and organize an incident command approach to prevent, prepare for and respond to environmental disasters and chemical releases.	By 2016, implement the pipeline strategy currently being developed under the leadership of MDEQ and the Attorney General.	MDEQ, MDNR, MDARD, Michigan State Police Department of Technology, Management and Budget	*Continue collaborative efforts to develop environmental emergency response planning.*
5	Develop and implement a uniform statewide sanitary code that is flexible and provides standards for site suitability based on risk. Establish a long-term, sustainable funding source to support onsite wastewater programs at the state and local levels and to assist financially distressed owners of private on-site wastewater systems with repair and replacement costs.	By 2020, every county health department has an inventory and assessment of private, single-family home water supplies and all septic systems. By 2020, secure a long-term funding source to complete the inventory and to assist distressed owners.	Legislature	• *Continue educating partnering agencies and decision makers on the impacts of antiquated and lack of septic systems on Tribal Waters.* • *Support efforts to develop point of sale inspection programs.*
6	Establish inspection requirements for residential on-site wastewater systems.	By 2020, implement a statewide requirement for periodic inspections of on-site septic system performance for properties with on-site wastewater systems.	Legislature	• *Work with local agencies to develop criteria suggestions for elected officials interested in developing ordinances for programs such as point of sale inspections, septic failures, illicit discharge regulation, etc.*

7	Develop marketing and education campaigns and outreach tools directed at homeowners' on-site wastewater management and maintenance and funding opportunities to assist with repair and replacement.	By 2020, increase the number of entities implementing outreach campaigns directed at homeowners on septic management.	NGOs, local units of government	*Continue efforts to educate the community on water quality issues, Tribal Programs, restoration efforts, homeowner responsibility, and cultural stewardship practices through outreach and education campaigns.*
8	Secure a long-term funding source to accelerate the cleanup of legacy contaminated sites.	By 2027, close and remove 7,500 sites from the 201 Facilities Inventory, National Priority List, Leaking Underground Storage Tank Site database and designated Areas of Concern.	Legislature	
9	Pass comprehensive legislation phasing out the use and sale of microbeads in Michigan.	By 2017, comprehensive legislation phasing out the use and sale of microbeads is signed into law.	Legislature	*Take part in consultation and comment efforts to support initiative.*
10	Establish research priorities for "emerging pollutants of concern" in partnership with Michigan's research universities to: • Better understand potential ecological and human health impacts. • Adapt monitoring protocols to detect concentrations, fate and transport. • Recommend standards for protection of human health and the environment. • Develop technologies to remove such pollutants from manufacturing processes.	By 2016, increase the number of evaluations and risk assessments completed, new standards developed, and monitoring protocols developed.	MDEQ, Michigan Department of Community Health	*Support collaborating agencies and universities on these research efforts.*
Goal 3: Michigan communities use water as a strategic asset for community and economic development.				
Outcome: Economic and community development plans and efforts fully leverage water assets to create great places to live, work, and play.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Potential Involvement SCITM**

1	Emphasize water resources as assets in state, regional, and community planning efforts to provide appropriate, sustainable protection and to fully leverage community-based economic opportunities.	Increase walkability score of waterfront communities to measure the effect of economic activity and investment on or near water in a community, watershed or region.	MSDHA, MEDC, MDEQ, MDNR regional governments, local units of government	• *Support development of ecotourism center in Saginaw Bay.* • *Work with agencies and organizations to plan property use in the Saganing area considering sustainable practice.* • *Promote Saganing area as an ecotourism opportunity for visitors.*
2	Host an annual mayor's summit focused on creating high-quality communities that leverage strategic water assets.	Increase in property values as a result of increased economic activity and investment on or near water in a community, watershed, or region.	Mayors	
3	Provide in-depth technical assistance to support communities with developing and implementing community visions and strategies for waterfront redevelopment, access, and use.	Increase in the number of communities participating in Redevelopment Ready Communities Program.	Regional and interagency teams	*Utilize agency assistance to develop Saganing as an access point for the Saginaw Bay and Lake Huron, while supporting local economy through the ecotourism message.*
4	Prioritize investments around strategic economic assets of commercial harbors and long-term, sustainable infrastructure.	By 2020, increase the percentage of commercial traffic and other economic activity at Michigan's commercial ports over a baseline established in 2015.	MDOT, MDNR, MDEQ's Office of the Great Lakes, Governor's Office of Public-Private Partnerships, commercial maritime interests, local planning professionals	

Goal 4: Michigan's water resources support quality recreation and cultural opportunities.

Outcome: Waters of the state are world renowned for recreational pursuits such as hunting, fishing, boating, and swimming.

#	Recommendation	Implementation Metric	Lead Actor	Potential Involvement SCITM

1	Expand the use of real-time monitoring and source tracking techniques at high-risk beaches by local health departments, counties, communities and universities, and address sources of beach contamination.	By 2020, all of Michigan's water meets total and partial body contact designated uses with no closures or advisories. Real time monitoring at all high-risk beaches.	MDEQ, local health departments, local units of government, universities	*Work with Central Michigan District Health Department, Saginaw Valley State University, and other collaborators to implement real-time monitoring on our beaches, impaired rivers, and other areas of interest.*
2	Continue national and regional coordination of mercury reduction activities, such as implementation of the Great Lakes Mercury in Products Phase-Down Strategy and the Great Lakes Mercury Emission Reduction Strategy.	Reduce the mercury levels in edible portions of Great Lakes, inland lakes and stream fish to below 0.35 parts per million by 2020.	MDEQ, MDCH	*Support collaborating agencies in efforts in mercury reduction through consultation, comments, and efforts as opportunities are presented.*
3	Prioritize infrastructure needs for repair and upgrade of public recreational harbors and their landslide access.	By 2020, increase the number of recreational harbors with asset management plans over a baseline established in 2015.	MDNR, Waterways Commission, MDEQ, MDOT	
4	Establish a harbor town program and improve marketing of harbors. The program should work with MDEQ to address sources of upstream sediment, sediment reduction and relocation strategies.	By 2017, establish a harbor town program.	MDNR	
5	Work with local partners to provide public access every five miles on the Great Lakes, on all priority lakes over 100 acres in size and on every five miles of navigable water, as environmentally appropriate.	Public access every five miles on the Great Lakes and on all priority inland lakes larger than 100 acres.	MDNR	*Develop the Saganing area as an access point to the Saginaw Bay and Lake Huron through an ecotourism effort.*
6	Work with stakeholders to develop and implement a designated water trail system for inland waterways and along the coast.	By 2020, a designated water trail system has been established by the MDNR.	MDNR, local units of governments, NGOs	*Support efforts of collaborating agencies.*
Goal 5: Michigan has a strategic focus on water technology and innovation to grow sustainable water-based economies.				

Outcome: Policies and innovative technologies are developed and adopted to grow and promote sustainable water-based economies.				
#	Recommendation	Implementation Metric	Lead Actor	Potential Involvement SCITM
1	Market the state's competitive advantage as a highly attractive place for business creation and investment because of our abundant natural water assets, water research capabilities, highly skilled talent, economic development expertise, and powerful tourism and business-marketing brand.	Increased the number of water-dependent companies and investments locating in Michigan. Specifically track aquaculture technology and related opportunities.	MEDC	*Work with agencies, organizations, universities, and other partners to provide opportunities for economic development, ecotourism, and research within the Saginaw Bay Watershed.*
2	Establish voluntary water efficiency targets for all major water sectors to reduce water use impacts and costs.	By 2020, develop a baseline for water usage, data collection and definitions to inform development of water conservation goals and objectives. Collect data for two years. Increase by 20% the number of businesses, industries, and municipalities with water efficiency within their water management plants.	Water use Sectors	
3	Promote innovative technologies that reduce cost and water loss, or convert waste products to usable materials.	By 2020, increase the number of new, innovative and cost-effective technologies, pilot projects, and startups are commercialized, come to market and result in connections with end users to reduce costs and water consumption, or convert waste products to usable materials and produce energy over a baseline established in 2015.	MDEQ, MDARD, MEDC	
4	Develop water conservation and reuse strategy for the state that incorporates the use of green infrastructure, grey water systems, and energy production that includes recognition programs.	By 2018, develop a water conservation and reuse strategy that identifies major sectors by water use and their locations.	MDEQ, MDARD, MDOT	*Develop a Tribal water conservation and reuse strategy that promotes sustainable practices such as green infrastructure, grey water systems, etc.*

5	Fund a pilot project, through a competitive bid process, for the initiation and evaluation of a new model for wastewater management. This pilot program will assess the opportunities and barriers to creating a "Water Resources Utility of the Future", focused on: • Reclaiming and reusing water • Extracting and finding commercial uses for nutrients and other constituents • Capturing waste heat and latent energy in biosolids and liquid streams • Generating renewable energy using its land and other assets • Using green infrastructure to manage storm water and improve urban quality of life.	By 2017, pilot project is funded.	Legislature	
6	Establish voluntary water efficiency targets for agriculture in areas of existing or potential water stress.	By 2017, develop a baseline for water usage, data collection and definitions to inform development of water conservation goals and objectives in areas of existing or potential water stress. Collect data for two years. Establish targets. Increase in the number of water stressed regions that have water efficiency plans and water efficiency targets by 2020.	MDARD	
7	Create a strategic focus on water innovation to attract and accelerate new technologies to market through a business-led council comprised of private investors, entrepreneurs, corporations, public agencies and universities to better	By 2020, increase the number of new, innovative and cost effective technologies, pilot projects, and startups that are commercialized, come to market and result in connections with end users to solve water problems	MDEQ, MEDC, MDNR, MDARD	*Support collaborative effort.*

	manage water challenges in Michigan and worldwide.	over a baseline established in 2015.		
Goal 6: Michigan invests in infrastructure and supports funding to maintain clean water and healthy aquatic ecosystems.				
Outcome: People support investment of both public and private funding of Michigan water resources.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Potential Involvement SCITM**
1	Implement a communication strategy focused on messages that link the relationship between investments in water infrastructure and clean water and the benefits infrastructure provides for drinking water, recreation, and cultural and economic opportunity.	By 2017, implement a communication strategy focused on connecting economic, environmental, social and cultural values to Water Strategy Outcomes.	NGOs, MDEQ, MDCH	• *Collaborate to provide the Tribal perspective on the implementation strategy.* • *Support implementation of communication strategy.*
2	Utilize pricing and funding strategies to support infrastructure improvements while allowing for water conservation.	By 2020, increase the number of communities that have pricing and funding strategies as part of their asset management plans to support infrastructure improvements over a baseline established in 2015.	Local units of governments, water utilities	*Develop Tribal implementation plan to work toward the goal of water conservation and sustainable funding for water programs.*
3	Evaluate current community practices regarding providing water to financially distressed customers to ensure all citizens have affordable access to water for drinking and sanitation.	By 2017, increase the number of communities that have practices in place to ensure financially distressed customers have access to water for drinking and sanitation over a baseline established in 2015.	Local units of governments, water utilities	*Continue efforts to provide safe, clean, water source to community members.*
4	Incentivize and require outcome-based asset management planning for all public water utilities that includes more efficient use of resources.	By 2020, require all major NPDES-permitted dischargers to develop and implement asset management planning for each system. By 2020, require all municipal community water suppliers serving	MDEQ	

		more than 1,000 people to develop and implement asset management planning for each system.		
5	Establish sustainable funding mechanisms to achieve the Water Strategy goals including water infrastructure management.	By 2020, implement a long-term funding strategy to achieve goals of the Water Strategy and support existing Quality of Life Agency programs and policies.	State agencies, Legislature	
6	Develop an "enterprise budget" in order to better understand the complex relationships between managing water, infrastructure needs and funding	By 2016, develop an enterprise budget for water to inform the long-term funding strategy.	MDEQ	
Goal 7: Michigan has integrated outcome-based monitoring systems that support critical water-based decisions.				
Outcome: Monitoring systems are in place at a scale and frequency to ensure water quality and quantity are maintained to support diverse uses and values.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Potential Involvement SCITM**
1	Implement a pilot decision support framework that includes monitoring; data and information; and analytical tools for assessing ecological, economic, social and cultural values and outcomes at local and regional watershed scales.	By 2017, fund and implement a water resource decision support framework that provides information about the integration of ecological, economic, social and cultural values and outcomes.	MDEQ, MDNR, MDCH, MDARD	• *Provide support to collaborating agencies as available.* • *Provide Tribal perspective.*
2	Develop a coordinated, comprehensive monitoring strategy for groundwater quantity and quality, including a data management system.	By 2018, implement a long-term groundwater monitoring strategy that provides information sufficient to assess status and trends in quality and predict impacts from groundwater withdrawal.	MDEQ	
3	Develop a long-term, sustainable funding source for groundwater and surface water quality and quantity monitoring that is continually improved with new technologies.	By 2018, fund and implement surface water and groundwater monitoring strategies that provide information sufficient to assess water quality and quantity status and trends, and detect	Legislature	

		emerging issues.		
Goal 8: Michigan has the governance tools to address water challenges and provide clean water and healthy aquatic ecosystems.				
Outcome: Policies, organizational and institutional structures are in place to achieve goals and outcomes of the Strategy.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Potential Involvement SCITM**
1	Enhance the understanding, knowledge and skill set of communities to facilitate and support community-based dialogue and water-related vision development.	By 2016, work with community foundations and private foundations to support community-based dialogues.	Community and private foundations	• *Continue efforts to support dialogue and collaboration with agency, organization, community, and university partners.* • *Continue to provide financial support through grant partnerships and Two-Percent funding opportunities.*
2	Create a statewide Water Fellows Program and Network to build community leadership and inform critical local leaders about how to leverage water resource assets to build community and economic vitality.	By 2016, establish and implement a Water Fellows Program	Private philanthropy	*Support effort as available through collaboration and providing input.*
3	Evaluate and implement necessary changes to laws including state and local land-use statutes as well as the Michigan Drain Code to create a more integrated, watershed based system for managing water at the landscape level and achieving water quantity and quality outcomes.	By 2016, create an ad hoc external advisory body to evaluate existing laws and statutes including the Drain Code and local land-use statutes. By 2018, panel should provide recommendations to the Directors.	MDEQ and MDARD Directors	• *Provide support as available.* • *Provide technical support.*

4	Retain full authority under the Clean Water Act to continue to manage Michigan's own water resources.	Continue assumption of federal programs under the Clean Water Act.	MDEQ	• *Retain programs delegated through Clean Water Act to manage Tribal Water Resources.* • *Obtain delegated authorities as necessary and available through US EPA for Tribal waters.*
5	Create an Interdepartmental Water Team to unite agencies to ensure a cohesive common strategy around implementation of the Water Strategy. The team will establish a process for stakeholder collaboration, criteria for setting implementation priorities, identifying cross agency joint projects and an approach to assess and evaluate progress achieved against the metrics and outcomes.	By 2015, create interdepartmental water team. By 2015, put a working agreement in place to establish implementation priorities, a process for stakeholder collaboration, and an adaptive management approach to evaluate progress achieved against metrics and outcomes.	MDEQ, MDNR, MDARD, and MEDC Directors	*Tribal staff will be available as a resource to the State of Michigan's Interdepartmental Water Team for continued collaboration and implementation of the Water Strategy.*

Goal 9: Michigan citizens are stewards of clean water and healthy aquatic ecosystems.

Outcome: Individuals and communities understand their responsibility for and make informed and responsible decisions regarding water resources.

#	Recommendation	Implementation Metric	Lead Actor	Potential Involvement SCITM
1	Integrate water literacy principles into place-based education and state of Michigan curriculum standards tied to Science, Technology, Engineering and Math (STEM) across all grade levels.	By 2016, develop a strategy to integrate freshwater literacy principles into place-based education and state curriculum standards.	MDEQ, MDNR, Department of Education, State Board of Education	*Continue to provide Two-percent funding to Environmental Education Program through the Isabella Conservation District, which follows curriculum standards of Michigan.*
2	Develop a survey tool to assess behaviors and attitudes toward Michigan's water resources to assess changes over time.	By 2016, develop a Grant chart that encompasses all implementation activity timelines. Develop clear metrics about stewardship related to: • Ability to fund water quality infrastructure • Measuring the	MDEQ, MDNR, Universities	

		community's connection to local water assets • Knowledge of, and affinity for, local waters • Metrics of volunteerism and local philanthropy that support a community's vision for water and water-related assets • Measuring actual progress versus planned		
3	Expand opportunities to engage citizen volunteers and participation, such as the Michigan Clean Water Corp (MI Corps) program, in gathering water quality and quantity data, in restoration, providing access and maintenance of important water-related resources.	By 2016, develop a list of participants and define engagement levels. Track progress toward increasing engagement levels.	MDEQ, MDNR	

From:	Finnell, Emily (DEQ)
To:	mi-waterstrategy
Subject:	FW: Michigan Water Strategy- Pokagon Band
Date:	Tuesday, March 08, 2016 11:30:25 AM
Attachments:	image001.png PBOPI_Water Strategy 2016.pdf

From: Goodheart, James (DEQ)
Sent: Tuesday, February 16, 2016 9:41 AM
To: Finnell, Emily (DEQ)
Cc: Cromell, Rachel (DEQ); Vaughn, Kari (DEQ); Copen, Leigh (DEQ)
Subject: FW: Michigan Water Strategy- Pokagon Band

Additional tribal comments on water strategy from my meeting last week. FYI-Jim G

From: Jennifer Kanine [mailto:Jennifer.Kanine@PokagonBand-nsn.gov]
Sent: Monday, February 15, 2016 8:18 AM
To: Goodheart, James (DEQ)
Cc: Allan, Jon (DEQ)
Subject: Michigan Water Strategy- Pokagon Band

Jim-

I wanted to send our information your way regarding the water strategy and the efforts that Pokagon Band believes they can contribute to.

Please feel free to contact me if you have any questions.

Thank you

Jennifer

Jennifer Kanine, PhD, AWB®
Director, Department of Natural Resources

Pokégnek Bodéwadmik
Pokagon Band of Potawatomi

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Pokégnek Bodéwadmik · Pokagon Band of Potawatomi
Department of Natural Resources

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Jim Goodheart
Department of Environmental Quality
Constitution Hall, 6th Floor South
525 West Allegan Street, P.O. Box 30473
Lansing, MI 48909-7973

Dear Mr. Goodheart:

The Pokagon Band of Potawatomi would like to thank the efforts that the Office of Great Lakes is doing to compile a water strategy for the State of Michigan. To make a guidance document that incorporates the health and biological integrity of the Great Lakes water resources as a driving force to economic prosperity will be beneficial to future generations.

The indigenous people of this area hold water as a sacred and essential element for life. To this day we hold water ceremonies to pray for the health of our waters. Women, like water, have life giving capabilities. In the Neshnabe culture it is the responsibility of all woman to protect the rivers, streams, lakes, and oceans for all life on Earth.

In an effort to support the State of Michigan Water Strategy the Pokagon Band Department of Natural Resources has listed activities currently occurring within the Pokagon community and future activities that would support the goals of the water strategy. You will find them as amendments in the right column of the attached 2015 Office of the Great Lakes Draft Water Strategy Table 2.

The road ahead will not be an easy one as common knowledge of water and how it is intertwined throughout our daily lives is lost to many. Watershed thinking and understanding the water cycle from when it starts as rain or snow across the landscape to the many paths it takes to reach our wetlands, rivers, streams, and lakes will be vitally important. The Clean Water Act has addressed many of the point sources issues of the past. In the future non-point sources need to be better managed to truly improve the health and biological integrity of our Great Lakes water resources.

Please do not hesitate to contact me if you have any questions regarding this submission. I can be reached via email at Jennifer.Kanine@PokagonBand-nsn.gov or at 269-462-4214.

Pokégnek Bodéwadmik · Pokagon Band of Potawatomi
Department of Natural Resources

Box 180 · 32142 Edwards Street · Dowagiac, MI 49047 · www.PokagonBand-nsn.gov
(800) 517-0777 · (269) 782-9602 · (269) 782-1817 fax

Sincerely,

Jennifer Kanine, PhD, AWB
Director, Department of Natural Resources
Pokagon Band of Potawatomi Indians

CC: Jon Allan

Goal 1: Michigan's aquatic ecosystems are healthy and functional.				
Outcome: Aquatic ecosystems are resilient and diverse.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Pokagon Band Activities**
1	Prevent the introduction of new aquatic invasive species and control existing populations of aquatic invasive species in accordance with the Michigan Aquatic Invasive Species Management Plan.	By 2020, the ecological separation of the Great Lakes basin and the Mississippi River basin, especially in the Chicago Area Waterways system has been initiated.	State and federal agencies, Nongovernmental organizations (NGOs), local units of governments, individuals	• Begin monitoring efforts for Aquatic Invasive Species • Continue efforts in finding funding sources • Create Aquatic Invasive Species Management Plan
2	Work with other Great Lakes states and provinces to harmonize aquatic invasive species prevention, early detection processes and response actions across the Great Lakes region.	By 2016, implement a pilot project with Ontario and interested states to evaluate and pursue areas of harmonization.	State agencies	• Continue and improve partnerships with Tribal, Federal, and State staff on aquatic invasive species issues
3	Accelerate research and solutions to identify mechanisms of food web disruption and changes of nutrient flows in the Great Lakes with a focus on the effects of invasive species.	By 2017, a minimum of three new research projects will be established for the purposes of evaluating nutrient shifts in Great Lakes food webs to help focus appropriate management, social, and economic responses.	Universities	• Explore partnerships with universities and colleges to study and improve water resources (SMC, Notre Dame, Grand Valley State, WMU, MSU, Purdue, CMU)
4	Develop a comprehensive strategy to prevent nuisance and harmful algal blooms.	By 2017, develop a strategy to prevent harmful algal blooms and HABs based on desired outcomes.	MDEQ, local public health departments	• Reduce nutrient runoff to reduce potential algal blooms a. Implement buffer areas around water resources b. Reduce mowing to promote native plants c. Implement nutrient reduction farming practices d. Work with county Health Departments to reduce failing septic systems

6	Develop harmful algal toxin water quality criteria and implement a real-time monitoring strategy for Michigan's Great Lakes drinking water intakes and public recreation locations threatened by harmful algae.	By 2020, increase by 20% the number of people served by drinking water suppliers using surface water sources with real-time monitoring equipment installed to provide early warning of potential public health threats. By 2020, develop harmful algal toxin assessment criteria. By 2020, implement a real-time monitoring strategy for Michigan's Great Lakes drinking water intakes and public recreation locations threatened by HABs.	MDEQ	• Support Great Lakes activities by Federal and State agencies. • Currently not an issue in Pokagon Band waters, observational monitoring by DNR is occurring for potential issues
8	Incorporate planning for wet weather extremes and increased variability into state, regional and community planning.	Best management practices are reviewed every five years and updated (if necessary) to reflect climatic changes such as changes in rainfall frequency, duration or intensity.	State, Governmental entities, communities	• Create a Pokagon Band storm water management plan • Update building code to better manage storm water • Incorporate more pervious surfaces and green initiatives • Support local agency storm water manage planning
	Provide technical assistance and develop technical tools and training programs for communities, local officials and water stakeholders to inform and improve their water literacy and help them integrate water impacts into local land-use planning and decisions.	By 2020, develop a public official water literacy measurement. By 2020, develop a training module for local elected officials and decision-makers on the connection between land-use planning and zoning and the siting and approval of new projects. By 2020, develop a training module for local elected officials and decision-makers on the merits and benefits of asset management planning.	Universities, regional government and planning organizations, MDEQ	• Continue outreach efforts to citizens via newsletters, website, and events • Continue work with watershed groups to educate and promote land-use practices that protect and improve water resources • Work with tribal planner to update building code and storm water management plan

10	Develop tools and guidance related to shoreline and riparian ecology and management and provide necessary technical support and training to municipalities, watershed-based organizations and landowners to achieve full benefits of riparian areas.	By 2020, develop a baseline for the current research and educational capacities. • Coordinate to pinpoint areas of capacity expansion. • Develop tools, guidance and training on best practices. • Determine need to update guidance and training materials.	MDNR, MDEQ	• Work with tribal planner to update building code and storm water management plan • Develop riparian management and guidance documents
11	Remove or improve dams that are no longer safe or ecologically, economically or socially viable to protect public safety and create healthy, connected aquatic systems.	By 2020, address all dams most at risk of failure.	MDEQ, MDNR	• Removed impoundment on Rodgers Lake Outlet (2015) • Support local efforts in address degrading water structures
12	Focus river and stream restoration efforts on addressing small hydrological impediments like culverts to create connectivity and restore stream stability.	By 2020, increase the number of small hydrologic impediments that are restored over a baseline established in 2015.	NGOs and local units of governments	• Continue working with watershed groups in inventorying culverts and impoundments • Support databases such as the new Fishworks database that documents location and information on culverts and impoundments in the Great Lakes area • Work with tribal planner to update building code and storm water management plan
13	Refine and improve the water withdrawal assessment process to ensure sustainable use of water resources and that high priority is given to incorporating existing and new data and models to better represent local and regional water resources and surface water/groundwater interactions.	By 2016, develop a list of priority Water Use Advisory Council recommendations and an implementation plan.	MDEQ, MDNR, MDARD	• Inventory water withdraws on Pokagon Band's lands. • Place meters on wells and create database to track use

14	Provide technical and financial support to communities to plan and implement green infrastructure techniques and low-impact development while preserving natural spaces in the design of new developments, redevelopments and road projects to ensure storm water management and improve hydrology.	By 2020, increase the number of attendees to green infrastructure conferences, applications for projects, amount of grant dollars awarded to projects incorporating green infrastructure or low-impact development, and number of programs incentivizing green infrastructure projects and the number of Michigan communities that are recognized for green infrastructure projects and strategies over a baseline established in 2015.	MDEQ, MDOT, MDNR, Michigan State Housing Development Authority, MEDC	• Work with tribal planner to update building code and storm water management plan • Develop riparian management and guidance documents • Continue efforts in finding funding sources
15	Modernize road and highway planning and infrastructure to effectively accommodate storm water runoff and infiltration needs, thereby reducing the costs and impacts of flooding.	By 2020, increase the number of Michigan's new road and highway projects designed to better accommodate storm water runoff and infiltration needs over a baseline established in 2015.	MDOT, local road and highway commissions	• Work with tribal planner to update building code and storm water management plan
16	Enhance financial and technical support of local stakeholder efforts to develop and implement watershed management plans to restore impaired waters, protect high quality waters, and develop and utilize local water resource assets.	By 2018, increase the number of grants, training and educational opportunities on the development and implementation of watershed management plans over a baseline established in 2015.	MDEQ	• Continue working with watershed groups • Continue assisting conservation districts with macroinvertebrate monitoring (MI Corp)
17	Use existing authority to work with local units of government with storm water discharge or storm water-related hydrologic impairments in their waterways to establish Phase II storm water plans for impaired water bodies.	By 2020, increase the number of water bodies with storm water plans in place to address designated use impairments caused by storm water discharges and hydrologic impairments over a baseline established in 2015.	MDEQ, MDNR	• Work with tribal planner to update building code and storm water management plan

18	Eliminate impairments in priority watersheds that have degraded water quality and/or aquatic ecosystems due to nutrient runoff and soil erosion. Engage landowners through a collaborative and adaptive community-based natural resource management process to identify local actions to change behaviors and solution to achieve those outcomes. Failure to achieve demonstrable outcomes within established timeframes could trigger additional measures.	By 2018, identify priority watersheds. Develop performance standards to cover statewide land-use activities. Agricultural land-use will directly follow MAEAP guidelines and participation criteria to remain consistent with the state's recent efforts. Concurrently develop the escalated "additional actions" triggered once a watershed has been determined to be impaired. By 2018, develop regional action teams with protocols for working with landowners. Educate collaborative teams on existing regulations and enforcement mechanisms allowed in their regions. By 2020, collaborative processes are in place with plans to achieve water quality outcomes in priority watersheds.	MDEQ, MDARD	• Lead by example by being proactive in community-based natural resources management • Continue work with watershed groups to educate and promote land-use practices that protect and improve water resources • Improve monitoring efforts in the Great Lakes and work with partners • Reduce nutrient runoff and sediment erosion a. Implement buffer areas around water resources b. Reduce mowing to promote native plants c. Implement nutrient reduction farming practices d. Work with county Health Departments to reduce failing septic systems

Goal 2: Michigan's water resources are clean and safe.				
Outcome: Surface and groundwater are managed to support sustainable human uses and ecological function.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Pokagon Band Activities**
1	Protect drinking and source water areas by: • Continuing to ensure remediation activities address the long-term impact on drinking water sources • Identifying and diligently protecting source water protection areas • Assisting well owners with identifying potential water well vulnerabilities • Focusing resources on contamination sources with the highest potential for causing contamination of drinking water supplies, including chemical storage facilities • Enhancing the drinking water • geographic information system database and making information available across • MDEQ programs and to local public • health department environmental health personnel • Supporting mapping of local groundwater conditions in partnership with well contractors and others who collect groundwater information.	By 2020, address IT security issues, such as firewall and server capacity, to make information publically available. By 2020, develop educational materials to encourage residents with private drinking water wells to test new wells prior to use for nitrates and arsenic and to test wells prior to sale or transfer for bacteria, nitrates and arsenic. By 2020, develop an interface to effectively and efficiently track and monitor for groundwater contamination, and implement data tracking.	MDEQ, local health departments	• Work with Facilities and Maintenance Departments to create well database and address abandoned wells • Work with county Health Departments or internally setup of a well testing program for tribal citizens • Create fund to assist tribal citizens to improve failing drinking water systems • Investigate Federal or Tribal dollars

2	Develop a plan for aquifer protection that addresses geothermal construction and proper abandonment of wells.	By 2016, convene a stakeholder work group to develop draft legislation to regulate closed-loop geothermal construction. By 2020, develop educational materials for community land- use water systems and local health departments to increase plugging rates of abandoned wells when municipal water mains are extended.	MDEQ	• Work with Facilities and Maintenance Departments to create well database and address abandoned wells
3	Establish inspection requirements for residential wells, including testing wells for nitrates, bacteria and arsenic.	By 2020, implement a statewide requirement for periodic inspections of drinking water quality.	Legislature	• Work with county Health Departments or internally setup a well testing program for tribal citizens • Create fund to assist tribal citizens to improve failing drinking water systems • Investigate Federal or Tribal dollars
4	Develop a spill and communication strategy and organize an incident command approach to prevent, prepare for and respond to environmental disasters and chemical releases.	By 2016, implement the pipeline strategy currently being developed under the leadership of MDEQ and the Attorney General.	MDEQ, MDNR, MDARD, Michigan State Police, Department of Technology, Management and Budget	• Work with Tribal Planner, Police Department, and County Emergency Response people in creating Tribal Emergency Response Plans
5	Develop and implement a uniform statewide sanitary code that is flexible and provides standards for site suitability based on risk. Establish a long-term, sustainable funding source to support onsite wastewater programs at the state and local levels and to assist financially distressed owners of private on-site wastewater systems with repair and replacement costs.	By 2020, every county health department has an inventory and assessment of private, single-family home water supplies and all septic systems. By 2020, secure a long-term funding source to complete the inventory and to assist distressed owners.	Legislature	• Work with county Health Departments or internally setup a septic testing program for tribal citizens • Create fund to assist tribal citizens to improve failing septic systems • Investigate Federal or Tribal dollars
6	Establish inspection requirements for residential on-site wastewater systems.	By 2020, implement a statewide requirement for periodic inspections of on-site septic system performance for properties with on-site wastewater systems.	Legislature	• Work with Facilities and Maintenance Departments to create septic system database • Work with county Health Departments or internally setup of a septic testing program for tribal citizens

7	Develop marketing and education campaigns and outreach tools directed at homeowners' on-site wastewater management and maintenance and funding opportunities to assist with repair and replacement.	By 2020, increase the number of entities implementing outreach campaigns directed at homeowners on septic management.	NGOs, local units of government,	• Continue outreach efforts to citizens via newsletters, website, and events • Continue work with watershed groups to educate and promote land-use practices that protect and improve water resources

Goal 3: Michigan communities use water as a strategic asset for community and economic development.

Outcome: Economic and community development plans and efforts fully leverage water assets to create great places to live, work and play..

#	Recommendation	Implementation Metric	Lead Actor	Pokagon Band Activities
1	Emphasize water resources as assets in state, regional and community planning efforts to provide appropriate, sustainable protection and too fully leverage community-based economic opportunities.	Increase walkability score of waterfront communities to measure the effect of economic activity and investment on or near water in a community, watershed or region.	MSDHA, MEDC, MDEQ, MDNR regional governments, local units of government	• Continue outreach efforts to citizens via newsletters, website, and events • Continue work with watershed groups to educate and promote land-use practices that protect and improve water resources
3	Provide in-depth technical assistance to support communities with developing and implementing community visions and strategies for waterfront redevelopment, access and use.	Increase in the number of communities participating in Redevelopment Ready Communities Program.	Regional and interagency teams	• Work with Human Resources Department to develop training session for tribal government decision makers

Goal 4: Michigan's water resources support quality recreation and cultural opportunities.

Outcome: Waters of the state are world renowned for recreational pursuits such as hunting, fishing, boating and swimming.

#	Recommendation	Implementation Metric	Lead Actor	Pokagon Band Activities
1	Expand the use of real-time monitoring and source tracking techniques at high risk beaches by local health departments, counties, communities and universities, and address sources of beach contamination.	By 2020, all of Michigan's water meets total and partial body contact designated uses with no closures or advisories. Real time monitoring at all high-risk beaches.	MDEQ, local health departments, local units of government, universities	• Continue E. Coli testing to track concerns • Work with State of Michigan on Statewide E. Coli TMDL
2	Continue national and regional coordination of mercury reduction activities, such as implementation of the Great Lakes Mercury in Products Phase-Down Strategy and the Great Lakes Mercury Emission Reduction Strategy.	Reduce the mercury levels in edible portions of Great Lakes, inland lakes and stream fish to below 0.35 parts per million by 2020.	MDEQ, MDCH	• Implement annual or bi-annual monitoring program for toxins in fish and wildlife • Provide a stance on mercury level concerns in the Great Lakes region to Federal and State agencies

Goal 5: Michigan has a strategic focus on water technology and innovation to grow sustainable water-based economies.				
Outcome: Policies and innovative technologies are developed and adopted to grow and promote sustainable water-based economies.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Pokagon Band Activities**
1	Market the state's competitive advantage as a highly attractive place for business creation and investment because of our abundant natural water assets, water research capabilities, highly skilled talent, economic development expertise, and powerful tourism and business-marketing brand.	Increase the number of water- dependent companies and investments locating in Michigan. Specifically track aquaculture technology and related opportunities.	MEDC	• Investigate business opportunities that use water in economic yet sustainable way Examples: 1. Hydroponics 2. Aquaculture 3. Geothermal
2	Establish voluntary water efficiency targets for all major water sectors to reduce water use impacts and costs.	By 2020, develop a baseline for water usage, data collection and definitions to inform development of water conservation goals and objectives. Collect data for two years. Increase by 20% the number of businesses, industries, and municipalities with water efficiency within their water management plans.	Water use sectors	• Inventory water withdraws on Pokagon Band's lands • Place meters on wells and create database to track use.
3	Promote innovative technologies that reduce cost and water loss, or convert waste products to usable materials.	By 2020, increase the number of new, innovative and cost- effective technologies, pilot projects, and startups are commercialized, come to market and result in connections with end users to reduce costs and water consumption, or convert waste products to usable materials and produce energy over a baseline established in 2015.	MDEQ, MDARD, MEDC	• Investigate business opportunities that use water in economic yet sustainable way • Work on building codes that incorporate more innovative technologies

4	Develop a water conservation and reuse strategy for the state that incorporates the use of green infrastructure, grey water systems, and energy production that includes recognition programs.	By 2018, develop a water conservation and reuse strategy that identifies major sectors by water use and their locations.	MDEQ, MDARD, MDOT	• Work with tribal planner to update building code

Goal 6: Michigan invests in infrastructure and supports funding to maintain clean water and healthy aquatic ecosystems.

Outcome: People support investment of both public and private funding of Michigan water resources.

#	Recommendation	Implementation Metric	Lead Actor	Pokagon Band Activities
1	Implement a communication strategy focused on messages that link the relationship between investments in water infrastructure and clean water and the benefits infrastructure provides for drinking water, recreation, and cultural and economic opportunity.	By 2017, implement a communication strategy focused on connecting economic, environmental, social and cultural values to Water Strategy outcomes.	NGOs, MDEQ, MDCH	• Continue outreach efforts to citizens via newsletters, website, and events • Continue work with watershed groups to educate and promote land-use practices that protect and improve water resources • Support Water Walkers and utilize them as partners in education
2	Utilize pricing and funding strategies to support infrastructure improvements while allowing for water conservation.	By 2020, increase the number of communities that have pricing and funding strategies as part of their asset management plans to support infrastructure improvements over a baseline established in 2015.	Local units of government, water utilities	• Work with Maintenance and Finance Department to set degradation rates on infrastructure to plan for the future.
3	Evaluate current community practices regarding providing water to financially distressed customers to ensure all citizens have affordable access to water for drinking and sanitation.	By 2017, increase the number of communities that have practices in place to ensure financially distressed customers have access to water for drinking and sanitation over a baseline established in 2015.	Local units of government, water utilities	• Create fund to assist tribal citizens to improve failing drinking water and/or septic systems. Investigate Federal or Tribal dollars.

Goal 7: Michigan has integrated outcome-based monitoring systems that support critical water-based decisions.				
Outcome: Monitoring systems are in place at a scale and frequency to ensure water quality and quantity are maintained to support diverse uses and values.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Pokagon Band Activities**
1	Implement a pilot decision support framework that includes monitoring; data and information; and analytical tools for assessing ecological, economic, social and cultural values and outcomes at local and regional watershed scales.	By 2017, fund and implement a water resource decision support framework that provides information about the integration of ecological, economic, social and cultural values and outcomes.	MDEQ, MDNR, MDCH, MDARD	• Provide tribal perspective

Goal 8: Michigan has the governance tools to address water challenges and provide clean water and healthy aquatic ecosystems.				
Outcome: Policies, organizational and institutional structures are in place to achieve goals and outcomes of the Strategy.				
#	**Recommendation**	**Implementation Metric**	**Lead Actor**	**Pokagon Band Activities**
1	Enhance the understanding, knowledge and skill set of communities to facilitate and support community-based dialogue and water-related vision development.	By 2016, work with community foundations and private foundations to support community-based dialogues.	Community and private foundations	• Continue outreach efforts to citizens via newsletters, website, and events • Continue work with watershed groups to educate and promote land-use practices that protect and improve water resources
3	Evaluate and implement necessary changes to laws including state and local land-use statutes as well as the Michigan Drain Code to create a more integrated, watershed based system for managing water at the landscape level and achieving water quantity and quality outcomes.	By 2016, create an ad hoc external advisory body to evaluate existing laws and statues including the Drain Code and local land-use statutes. By 2018, panel should provide recommendations to the Directors.	MDEQ and MDARD Directors	• Educate State on Treaty and Sovereign Rights that come along with changing laws and codes
	Retain full authority under the Clean Water Act to continue to manage Michigan's own water resources.	Continue assumption of federal programs under the Clean Water Act.	MDEQ	• Educate State on Treaty and Sovereign Rights that come along with Clean Water Act authority

	Create an Interdepartmental Water Team to unite agencies to ensure a cohesive common strategy around implementation of the Water Strategy. The team will establish a process for stakeholder collaboration, criteria for setting implementation priorities, identifying cross agency joint	By 2015, create interdepartmental water team. By 2015, put a working agreement in place to establish implementation priorities, a process for stakeholder collaboration, and an adaptive.	MDEQ, MDNR, MDARD and MEDC Directors	• Support efforts for a water team • Have meetings with local DNR/DEQ offices

Goal 9: Michigan citizens are stewards of clean water and healthy aquatic ecosystems.

Outcome: Individuals and communities understand their responsibility for and make informed and responsible decisions regarding water resources..

#	Recommendation	Implementation Metric	Lead Actor	Pokagon Band Activities
1	Integrate water literacy principles into place-based education and state of Michigan curriculum standards tied to Science, Technology, Engineering and Math (STEM) across all grade levels.	By 2016, develop a strategy to integrate freshwater literacy principles into place-based education and state curriculum standards.	MDEQ, MDNR and Department of Education, State Board of Education	• Keep Education Department informed of State progress • Work with Education Department to integrate water education in curriculum
2	Develop a survey tool to assess behaviors and attitudes toward Michigan's water resources to assess changes over time.	By 2016, develop a chart that encompasses all implementation activity timelines. Develop clear metrics about stewardship related to: • Ability to fund water quality infrastructure • Measuring the community's connection to local water assets • Knowledge of, and affinity for, local waters • Metrics of volunteerism and local philanthropy that support a community's vision for water and water- related assets • Measuring actual progress versus planned	MDEQ, MDNR, Universities	• Implement surveys during annual meetings or census surveys.

3	Expand opportunities to engage citizen volunteers and participation, such as the Michigan Clean Water Corp (MI Corps) program, in gathering water quality and quantity data, in restoration, providing access and maintenance of important water- related resources.	By 2016, develop a list of participants and define engagement levels. Track progress toward increasing engagement levels.	MDEQ, MDNR	• Continue assisting conservation districts with macroinvertebrate monitoring (MI Corp) • Continue work with watershed groups to educate and promote land-use practices that protect and improve water resources

From:	Finnell, Emily (DEQ)
To:	mi-waterstrategy
Subject:	Peter Bormuth Written Comments
Date:	Wednesday, March 09, 2016 1:23:15 PM
Attachments:	Water Strategy Comments - from Peter Bormuth.pdf

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Emily Finnell
Office of the Great Lakes | MI Department of Environmental Quality
PO Box 30473
Lansing, MI 48909
finnelle@michigan.gov
517-284-5036

Amy Torres

From: peter bormuth [redacted]
Sent: Wednesday, July 29, 2015 9:57 AM
To: Amy Torres
Subject: RE: Draft Water Strategy Attached.

Amy

I read the entire draft this morning.

I have a number of comments but the most important one concerns Groundwater.

The Draft states that groundwater should be managed for human uses and environmental integrity.

Our groundwater in the lower Michigan basin is currently being threatened by two industry practices:

1) hydraulic fracturing (for oil or natural gas), and

2) underground waste disposal wells (for brines, fracking fluids and other oil well waste products).

With regard to the first issue, hydraulic fracturing, scientific evidence is emerging that fracking fluids can migrate into underground water reservoir's.

(see EPA Draft Investigation on Groundwater Contamination near Pavillion, Wyoming (EPA 600/R-00/000 December 2011) which concludes "that constituents associated with hydraulic fracturing have been released into the Wind River drinking water aquifer at depths above the current production zone." This proves that the EPA knows injected fluids can migrate upwards and that they have previously made mistakes with regard to impermeability of rock formations when issuing permits; see also Myers, *Ground Water*, (April 2012) POTENTIAL CONTAMINANT PATHWAYS FROM HYDRAULICALLY FRACTURED SHALE TO AQUIFERS. Shows that brines existing more than a 1000 meters above their source is evidence of upward movement from depth to surface and shows that the injection at pressure can cause contaminants to reach overlying formations by simple displacement of fluids from shale into the overburden and claims that advective transport (considered as simple particle velocity) will manifest if there is a significant vertical component to the regional hydraulic gradient; see also Weaver; Frape; Cherry, *Geol. Soc. Am. Bull.* 107 (1995) – RECENT CROSS-FORMATIONAL FLUID FLOW AND MIXING IN THE SHALLOW MICHIGAN BASIN – This study documents upward migration of saline fluid into the overlying glacial sediments during the historic period since petroleum production began. The fracture intensification and increased permeability of the near surface layers above 1000 feet has been interpreted to reflect isostatic rebound following the retreat of the glaciers. The study area was on the edge of the Michigan basin in Ontario but the authors note a correlation with the Detroit River Group in central Michigan; see also Warner; Jackson; Darrah; Osborn; Down; Zhao; White; Vengosh. *Proceedings of the National Academy of Sciences*, (May 2012) GEOCHEMICAL EVIDENCE FOR POSSIBLE NATURAL MIGRATION OF MARCELLUS FORMATION BRINE TO SHALLOW AQUIFERS IN PENNSYLVANIA. Describes the evidence for upward cross formational flow of Marcellus formation brine into shallow aquifers; see also Middleton; WHAT LIES BENEATH: THE THREAT FROM OILFIELD WASTE INJECTION WELLS, published May 18, 2006. Details the complaints to the Texas Railroad Commission of groundwater contamination in Texas because of oil waste injection wells).

With regard to the second issue, underground waste disposal wells, I have identified 19 wells in lower

Michigan that endanger our underground sources of water: WI Permit #30108, #30248, #30123, #36867, #31503, #36958, #30229, #40099 in Calhoun County, Michigan; WI Permit #36629, #42486, #37378 in Macomb County, Michigan; WI Permit #23252, #23701, #23011, #22661 in Saint Clair County, Michigan; and WI Permit #25224, and #20452 in Allegan County, Michigan; West Bay #22, Permit#: MI-075-2D-0009 in Jackson County and Haystead #9, Permit #. MI-075-SD-0010 in Jackson County. There may be more. Each well is permitted to inject waste to a geologically inappropriate strata (the Salina Group Anhydrite & Salt layers) that will convert to gypsum and dissolve and fracture allowing the injected liquid waste to migrate upwards into our underground water supplies. EPA Permit #MI-163-3G-A002, issued June 14, 2006, for the Sunoco Inkster Facility in Wayne County proves that this will happen. This permit authorized injection of water to dissolve the same Salina Group salt and anhydrite layers that are supposedly acting as barriers to flow in the above numbered wells.

Please pass these comments on to your committee.

Peter Bormuth

From: [redacted]
To: [redacted]
Subject: FW: Draft Water Strategy Attached.
Date: Thu, 23 Jul 2015 21:45:02 +0000

From: Vaughn, Karl (DEQ) [mailto:VaughnK3@michigan.gov]
Sent: Wednesday, July 15, 2015 10:47 AM
To: Amy Torres
Subject: Draft Water Strategy Attached.

Good Morning Ms. Torres,

Please find the Draft Water Strategy attached, I apologize for it being missing from the original email. It is also available at the information link provided in the email as well.

From:	Finnell, Emily (DEQ)
To:	mi-waterstrategy
Subject:	Dick Micka Written Comments
Date:	Wednesday, March 09, 2016 1:23:17 PM
Attachments:	Dick Micka Comments - Michigan Water Strategy - 7-30-15.pdf

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Emily Finnell
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INTERNATIONAL WILDLIFE REFUGE ALLIANCE

September 3, 2015

Jon:

History of the Great Lakes is missing from the Water Strategy. I don't know why I didn't think of it sooner. The National Park Service has it on their radar! I am on the Michigan Historical Commission which now reports to the DNR. The DNR is re-assessing Boards and Commissions. I am working with Mark Hoffman to create a "Heritage Act" that

Richard & Jeanne Micka
[redacted]

would consolidate all of the natural, cultural, historic and scenic resources under the DNR's purview. This could incorporate the water strategy as well!

Sorry I didn't think of this sooner but the gap needs to be filled.

Best regards,

Dick

cc Emily Finnell
Mark Hoffman, MDNR
encl.

P.A. 109-436

COMMENTS 7.30.15

* See Over

MICHIGAN WATER STRATEGY

Emily:

Add One more chapter (10) for the Michigan Waters Strategy:

Reconcile National Goals and Objectives (Navigable waters of the U.S) under the Water Resources Development Act (WRDA) authorized by Congress with Michigan Waters Strategy (values and assets) set aside. Today, the U.S Army Corps of Engineers is required to coordinate their projects (permits) with the MDEQ under the Coastal Zone Management Act but their influence is limited because of Congressional mandates. The U.S. Government sees the Great Lakes as a vast transportation system everything else takes second place under the National Environmental Policy Act (NEPA) and the Clean Water Act (Sect. 404) - Contact the District Engineer, Detroit for details on WRDA.

Part of the National debate now centers on the Great Lakes Restoration Initiative (GLRI) which has a watershed component. The National Oceanic and Atmospheric Administration (NOAA) is one of the lead agencies along with the US Environmental Protection Agency (EPA). Currently, the US EPA and its Great Lakes National Program Office (GLNPO) is consolidating everything they can to streamline resolution of Annex 2, Great Lakes Water Quality Agreement (GLWQA) to remove Areas of Concern and restore Beneficial Use Impairments on the Great Lakes

X The Things left out of the current Vision
MICHIGAN'S WATER STRATEGY

(1)

Emily and Jon - some things to think about that are not in the "Water Strategy" but have been proposed over the last 20 years:

From: R.G. Micka 734-242-0909 RGM@CORE-COM

- NAWAPA - North American Water and Power Alliance. The "Canadian" shield - ie diversion of the Ogoki Rivers from Hudson Bay to Long Lac & Lake Superior. Also Hydro power in northern Quebec (Nunavut). This includes the Rampart Range in the Rockies and Arizona. There is a book on this "Canada's Water For Sale" by Richard C. Bocking Google Books

- ST Lawrence Seaway / Water Resources Development Act to study Panamax (35 ft draft) Expand the Welland Canal (depth draft/ wider) Affects the Soult locks - U.S Army Corps of Engineers / Congress regulates via!

- ICONN / Erie Island Complex Offshore New Jersey - New York and the Erie Canal (Clinton's Ditch). Dredge Erie Canal from Buffalo to Albany. Deposit dredgings on the Cholera Bank off Long Island, N.Y. in deep water to create a harbor for mega-container ships (1,200 footers) (72 ft draft). Part of what drives this is the need for ~~heavy~~ moving coal to power plant on Long Island by water. East Coast is all light rail - can't handle the heavy coal loads. Coal from Montana (low sulfur) will come by barge on the Erie Canal. We need a deep draft

R. G. Micka
[redacted]

harbor on the East Coast to handle the "big" ships. Currently, the US is years behind on this. All of this affects Michigan's Water Strategy Transportation on the Great Lakes to the Erie Canal.

– Doxiadis. Constantinos Doxiadis, the Greek Architect commissioned by DTE in the 1960s came up with a scheme of "Ekistics" that created not only the Detroit "Megalopolis" on the Detroit River but ~~an~~ an "Ecumenopolis" that includes Detroit, Cleveland and Chicago – essentially all of the Great Lakes! He recommended the use of Super Sewers etc. About this time Gerald Romax, DPS for city of Detroit, responded to environmental criticism with his famous quote "Put diapers on the ducks"! Eventually, Doxiadis relented in his approach once he realized the value of the Great Lakes and added "Ekumenokipos" to his scheme of "Ekistics". Ekumenokipos means the "world garden". We can use this. DTE has the study!!!

– Drain Lake Erie. A Toronto Futurist (Manc?) Canada would gain thousands of square miles of agriculture land and shipping would be confined to 35 ft deep dredge cuts. This may become a reality if HABs become epidemic.

R. G. Micka
[redacted]

WRDA (Everything starts in) (3)
US Congress!
even GLRI

Emily + Jon - one further thought:
(See Pg 59 Draft #7 work with Congress to do this)

Under the Water Resources Development Act (WRDA), the Congress tells us what the ~~Cor~~ Corps of Engineers is going to do on the Great Lakes. This is billions of dollars of work between reauthorizations of the Act. I don't know when the last one was authorized. The District Engineer in Detroit can tell you all about this. The State of Michigan should be included in these deliberations when they take place to make sure the projects are "environmentally sustainable" on the Great Lakes without some kind of repercussions in the political arena. Our Congressional delegation needs to be on those Committees that influence those budgetary considerations. This could help forestall some work on the connecting channels that makes it impossible for us to control velocities and erosion.

Also, keep in mind that Doxiadis set the stage for the "World Harden" (Ekumeno Kipos). This sets the stage for "Heritage Resources of the Great Lakes"

Natural (Wildlife) Recreational (Include Hunting = Fishing Bird watching etc.)
Cultural (People) Scenic
Historical (Maritime Nautical)
Archaeological

This is now the National norm!

* See first sentence INTRODUCTION - Heritage

FIGHT POLLUTION
Lake Erie Clean-Up Committee, Inc.
47 East Elm Avenue
Monroe, Michigan 48162-2648
734-242-0904

August 1, 2015

Dear Ms. Finnell:

Thank you for the water strategy presentation on Thursday, 7.30.15, at the Washtenaw County Community College. I left my hand written comments for you and Ms. Allen. Here is the official documentation on the only recourse the State of Michigan has for Federal Projects and other oversight of the "Navigible waters of the United States" CZM Certification

R.G. Micka
RGM@CORE.com

(over)

US Army Corps of Engineers
Detroit District

Joint Public Notice

Applicant: Norman Blanchett

In Reply Refer To: Corps File No. 99-001-033-1
MDEQ File No. 01-58-60

Date: April 19, 2002
Expires: May 3, 2002

Proposed culvert through dike to drain farmed wetlands adjacent to Lake Erie At Berlin, Michigan

Applicant: Norman Blanchett

Project Location: Section 8 & 9, Township 6S, Range 10E, Berlin, Monroe County, Michigan. The site is bounded by Lily Patch Road, Trombley Road, and Blanchett Street.

Federal Authority: The applicant has applied for a Department of the Army permit under Section 404 of the Clean Water Act.

State Authority: Section 401 of the Clean Water Act requires that all discharges of dredged or fill material must be certified by the State as complying with applicable effluent limitations and water quality standards. This public notice serves as an application to the State of Michigan Department of Environmental Quality, Land and Water Management Division (MDEQ) and constitutes its public notice as required by Section 401 of the Act. Coastal Zone Management Certification (or waiver thereof) is required from the State of Michigan if this proposed activity would occur within the designated coastal zone.

Project Description: As shown on the attached plans, the applicant proposes to:

Install a 12-inch diameter flap-gated culvert through a flood control dike to create one-way, field-to-lake drainage from a drainage ditch into Lake Erie. The stated purpose is to remove excess surface water from a 40-acre farmed field.

Excavate a 20' x 3 ' area through a flood protection dike down to an elevation slightly below 572.2' (IGLD 1985). Set bottom of culvert at 572.2 feet (IGLD 1985) and backfill with clean fill material to top of dike.

Approximately 24 acres of the field, the area lying at and below the 573' IGLD 1985 elevation, is farmed wetland. Runoff from the field has for decades been pumped from the drainage ditch over the dike, in the spring and after heavy rains, into Lake Erie to allow farming on the low-lying portion or the farmed wetland. The bottom of the culvert is proposed to lie at 572.2 IGLD 1985 (573 NGVD 1929) and would drain some portion of the adjacent farmed

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INTERNATIONAL WILDLIFE REFUGE ALLIANCE

September 3, 2015

Emily:

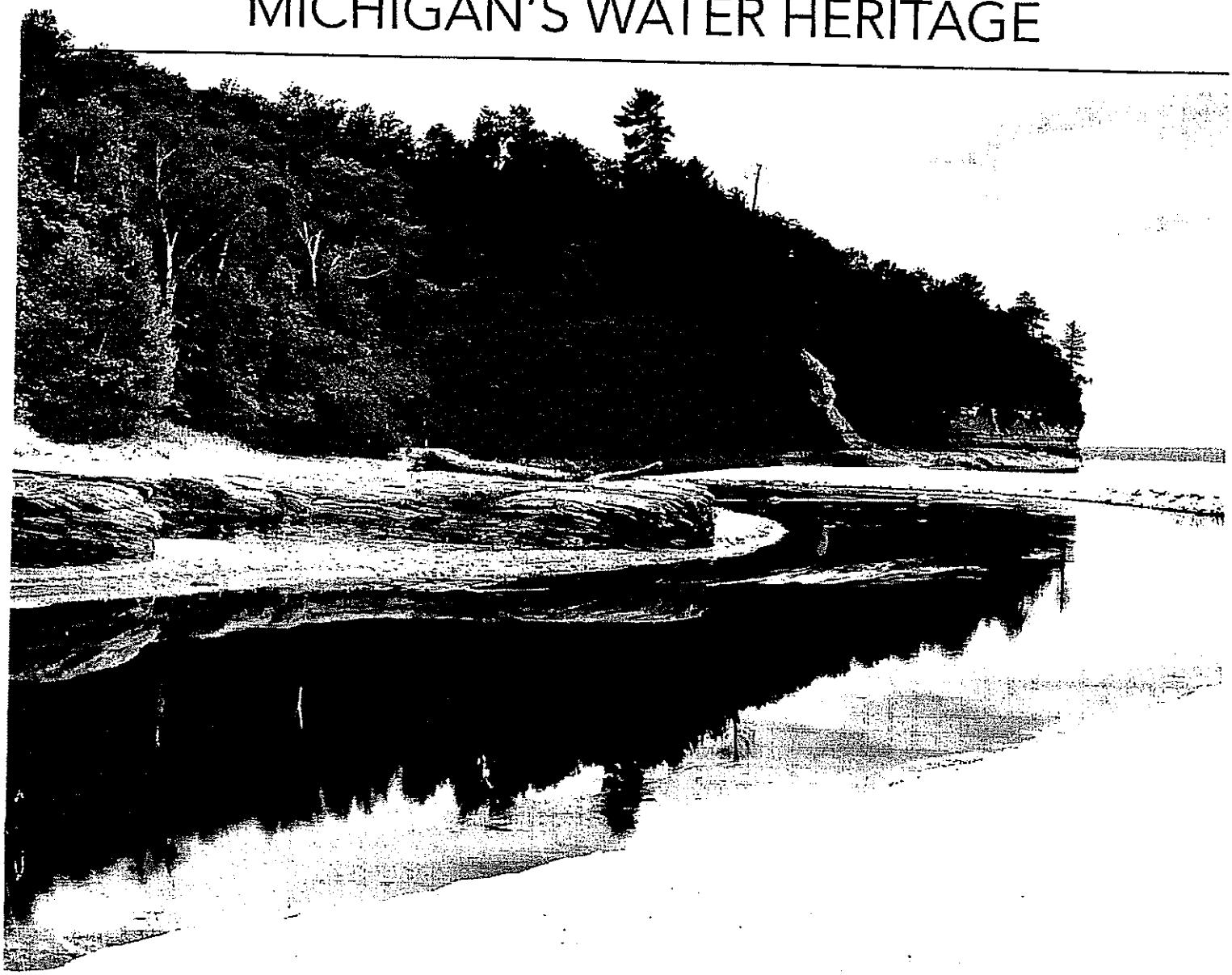
When something is so obvious, you can't see it. We need to add the Heritage Resources of the Great Lakes to the Water Strategy. I sent Director Allan a copy of what the National Park Service is doing. This is a good model.

Dick Micka

encl.
PA 109-436

Richard & Jeanne Micka
[redacted]

SUSTAINING
MICHIGAN'S WATER HERITAGE



A Strategy for the Next Generation

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Add Chapter 10: Heritage Resources of the Great Lakes (natural, cultural historic, scenic)

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Public Law 109–436
109th Congress

An Act

Dec. 20, 2006
[S. 1346]

To direct the Secretary of the Interior to conduct a study of maritime sites in the State of Michigan.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Michigan Lighthouse and Maritime Heritage Act.

SECTION 1. SHORT TITLE.

This Act may be cited as the "Michigan Lighthouse and Maritime Heritage Act".

SEC. 2. DEFINITIONS.

In this Act:

(1) SECRETARY.—The term "Secretary" means the Secretary of the Interior.

(2) STATE.—The term "State" means the State of Michigan.

SEC. 3. STUDY.

(a) IN GENERAL.—The Secretary, in consultation with the State, the State Historic Preservation Officer, and other appropriate State and local public agencies and private organizations, shall conduct a special resource study of resources related to the maritime heritage of the State.

(b) PURPOSE.—The purpose of the study is to determine—

(1) suitable and feasible options for the long-term protection of significant maritime heritage resources in the State; and

(2) the manner in which the public can best learn about and experience the resources.

(c) REQUIREMENTS.—In conducting the study under subsection (a), the Secretary shall—

(1) review Federal, State, and local maritime resource inventories and studies to establish the potential for interpretation and preservation of maritime heritage resources in the State;

(2) recommend management alternatives that would be most effective for long-term resource protection and providing for public enjoyment of maritime heritage resources;

(3) address how to assist regional, State, and local partners in increasing public awareness of and access to maritime heritage resources;

(4) identify sources of financial and technical assistance available to communities for the preservation and interpretation of maritime heritage resources; and

(5) identify opportunities for the National Park Service and the State to coordinate the activities of appropriate units

of national, State, and local parks and historic sites in furthering the preservation and interpretation of maritime heritage resources.

(d) REPORT.—Not later than 3 years after the date on which funds are made available to carry out the study under subsection (a), the Secretary shall submit to the Committee on Energy and Natural Resources of the Senate and the Committee on Resources of the House of Representatives a report that describes—

(1) the results of the study; and

(2) any findings and recommendations of the Secretary.

SEC. 4. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated such sums as are necessary to carry out this Act.

Approved December 20, 2006.

LEGISLATIVE HISTORY—S. 1346:

SENATE REPORTS: No. 109–234 (Comm. on Energy and Natural Resources).
CONGRESSIONAL RECORD, Vol. 152 (2006):
Sept. 29, considered and passed Senate.
Dec. 6, considered and passed House.

O

TORI NPS 8·1·11 11am
Dossier

United States Department of the Interior

National Park Service

Midwest Region
601 Riverfront Drive
Omaha, Nebraska 68102-4226

June 8, 2011

Laura Jacobs
President
Association for Great Lakes Maritime History
P.O. Box 484
Bowling Green, OH 43402

Dear Laura Jacobs,

On behalf of the National Park Service, I would like to invite you to attend an interdisciplinary meeting to help improve the interpretation and protection of maritime heritage resources in Michigan and to increase awareness and enjoyment of these resources. This meeting is part of the NPS's Michigan Maritime Heritage Special Resource Study, an effort to develop recommendations for the long-term protection, interpretation, and promotion of Michigan's maritime heritage resources. On August 1st, 2nd and 3rd, we will be holding meetings in different regions of the state for selected area stakeholders to discuss alternative options and the capacity of potential partners. As a representative of an organization with a stake in Michigan's maritime heritage, we would be thrilled if you could attend and contribute to the discussion.

First, I would like to give you some background on our charge and our goals. The Michigan Lighthouse and Maritime Heritage Act of 2006 (Public Law 109-436) asks the NPS to work in consultation with State of Michigan and local public agencies to: (1) "establish the potential for interpretation and preservation of maritime heritage resources" in Michigan, (2) develop management alternatives for "long-term resource protection and public enjoyment," (3) "address...increasing public awareness and access" (4) "identify sources of financial and technical assistance" (5) identify opportunities for parks and historic sites to coordinate.

The Michigan Maritime Heritage Special Resource Study has been underway since early 2010. The team assembled for this study includes planners from the NPS' Midwest Regional Office as well as representatives of National Parks in Michigan and the state history programs. Phase One of this study, consisting of a survey to examine currently publically accessible and interpreted maritime heritage resources in Michigan, was completed last summer. Maritime heritage resources are historic resources that are present because of the coastal location, and derive their significance from contributions to Michigan's maritime heritage. Main resource categories include the maritime industry, lighthouses, watercraft, navigational aids, harbors, and other cultural resources.

This fall, the NPS presented survey findings to the Michigan Maritime Heritage study team, and using information this survey provided on current resource protection and interpretation, the team identified needs and gaps. The team came up with 7 categories of goals for preserving and

TAKE PRIDE IN AMERICA

interpreting maritime resources: Sustainable Funding Sources, Coordinated Administration, Program Design, Promotion, Technical Support and Assistance, Building Partnerships, and Protection Mechanisms. This winter, the team met again to develop "preliminary alternatives," or different options for meeting the goals we developed. We came up with two action alternatives for our study to evaluate more deeply: a National Historic Trail that follows the historic trading and shipping routes in the Great Lakes, and an alternative of coordination and technical support through NPS staff based in Michigan NPS units. It is these alternatives that we would like to present to stakeholders for input and gauging interest in participation. We are also open to other ideas you may have about how to best achieve our goals.

We will be holding three facilitated meetings in Michigan the week of August 1st, in different areas of the state. All three meetings will cover the same content, so please choose whichever is most convenient for you to attend.

August 1st, 11am – 4pm: Detroit (Location TBA)
August 2nd, 11am – 4pm: St. Ignace (Location TBA)
August 3rd, 10am – 3pm: Muskegon (Location TBA)

Lunch will be provided, courtesy of the State of Michigan. Please RSVP via the enclosed postcard by June 24th. If you are unable to attend but would like to designate someone else from your organization to attend in your stead, please feel free to do so. If you RSVP that you're able to attend the meeting, we will send you the address and password to a website designed especially for this meeting to learn more about the study and begin formulating your questions and ideas. If you cannot attend but would like to access the website, please indicate that on your RSVP card.

If you would like to speak to me about the meetings or learn more about the study, please don't hesitate to contact me via email at ruth_heikkinen@nps.gov or by phone at 402.661.1846. A representative from the Michigan Maritime Heritage study team will be in touch in the coming weeks to follow up with you and answer any questions you may have. Thank you, and I look forward to your contribution to this important study.

Best regards.

Ruth Heikkinen
Project Manager, Michigan Maritime Heritage Special Resource Study
Planner, Midwest Region, National Park Service

What should be done to better preserve Michigan Maritime Heritage resources?
Results from our facilitation exercise in October creating major categories for our ideas for preserving and interpreting maritime heritage in Michigan:

Sustainable Funding Sources
- Sustainable Funding for Coordinated Efforts
- Sustainable Funding for Local Maritime Resources/Site Project
- Grants for Bricks and Mortar (Small/Challenge) (Beyond Lighthouses)
- Encourage CZM to Fund MTR Projects
- Provide Federal Funding, Including No Match Grants

Coordinated Administration
- Coordinated Network of Michigan Maritime Heritage Sites
- Develop a "Michigan Maritime Heritage" Identity with Standards
- Coordinate Marketing and Public Information Materials
- Better Coordination Between Existing NPS Units to...
- An Organization Focused Only on Michigan Maritime
- Organizational Structure (Maritime Heritage Office)
- Regional Identity Branding
- Regional Connectivity
- Regional Non-Profit Consortiums for Interpretive Support

Promotion
- Maritime Resources Guidebook (e.g. African-American Heritage)
- County and Municipal Websites Should Highlight their Maritime Heritage
- A Michigan Maritime Historic Inn Program
- A Single Website (QR Linked)
- Coordinate an Online (Alternative Media) Effort
- Central Effort to Theme and Link

Program Design
- ID Resources Needing Outdoor Interpretation
- Signage Standards – Wayfinding
- Develop Standards and Graphic Standards for Interpretive Tools and Materials
- Paint on Pavement for Walkways and Riverwalks
- Encourage Corporate History Signage for Active Industry
- Gateway Panel Sign System – Thunder Bay (Alpena)
- Further (Beyond Study) Investigate National Significance of Possible Eligible Sites – NHLs, NRs
- Cross Natural/Cultural/Recreational Interpretation
- Outreach to Diverse Audiences
- Attempt to Include Cultures that Aren't Routinely Expressed Through "Mainstream" Interpretation
- Standards for Interpretation
- Set Standards for Maximum "Value" (Avoid Discrepancies in Fee Values)
- Set Standards for Accessibility (ADA)

Technical Support and Assistance
- Maritime Preservation/Interpretation Field Reps
- Provide Limited Term NPS Staff to State of Michigan
- Provide Technical Assistance – Maintenance and Restoration
- NPS: Provide Administrative and Coordination Assistance to Local, State, and National Partners
- Develop and Present "Successful" Case Studies...Examples for Other Communities/Efforts to Learn From
- Internships and Cooperative Arrangements with Universities

Build Partnerships
- Strong Heritage Water Trail/Boat Rental Connection
- Connect to Boating Community (Pleasure and Commercial)
- Build Local "Ownership" for Sites
- Stress Learning about Maritime Heritage in Local Schools

Protection Mechanisms
- Protection Mechanisms (Zoning, Easements, etc.)
- Strengthen Local Preservation in Coastal Communities (e.g. Ordinances, Guidelines)

Michigan Maritime Heritage Special Resource Study
Study Team Members

Tom Baker, Park Ranger/Management Assistant, Keweenaw National Historical Park

Gregg Bruff, Chief of Heritage Education, Pictured Rocks National Lakeshore

Sandra Clark, Director, Michigan Historical Center

Summer Sky Cohen, Tribal Historic Preservation Officer, Keweenaw Bay Indian Community

Brian Conway, State Historic Preservation Officer, Michigan State Housing Development Authority

Ray Fahlsing, State Park Stewardship Program, Michigan DNR

Natalie Franz, Community Preservation Planner, Midwest Regional Office - National Park Service

Ruth Heikkinen, Chief of Planning and Compliance and Project Manager, Midwest Regional Office - National Park Service

Eric Hemenway, Little Traverse Bay Bands of Odawa Indians

giiwegiizhigookway Martin, Tribal Historic Preservation Officer, Ketegitigaaning Ojibwe Nation

Lisa Myers, Chief of Interpretation and Visitor Services, Sleeping Bear Dunes National Lakeshore

Barbara Nelson-Jameson, Rivers and Trails Conservation Assistance Program, National Park Service

Laura Quackenbush, Museum Technician, Sleeping Bear Dunes National Lakeshore

Dena Sanford, National Register Programs, Midwest Regional Office - National Park Service

Matt Smar, Michigan Coastal Management Program, Office of the Great Lakes, Michigan DEQ

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Natalie Franz
Community Preservation Planner – Midwest Region
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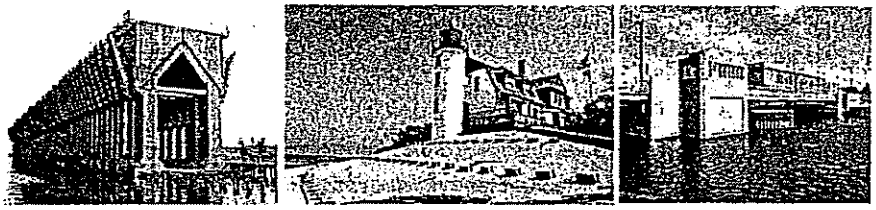
Omaha, NE 68102
(402) 661-1856
natalie_franz@nps.gov

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

Targeted Scoping Meetings

August 1st, 2nd, and 3rd, 2011



The Secretary of Interior shall "determine suitable and feasible options for the long-term protection of significant maritime heritage resources in the State and the manner in which the public can best learn about and experience the resources" – Michigan Lighthouse and Maritime Heritage Act (Public Law 109-436)

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Michigan Maritime Heritage Special Resource Study

The Special Resource Study Process

Initiated by law. Used to evaluate whether or not resources qualify to be included in the National Park System.

Criteria for Inclusion:

- **National Significance**
  Are resources National Historic Landmark (NHL) eligible?
- **Suitability**
  Are comparable resources protected elsewhere?
- **Feasibility**
  What are the costs, land restrictions, public support, etc.?
- **Necessity for NPS Management**
  Would NPS be the best manager?

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Michigan Maritime Heritage Special Resource Study

The Michigan Maritime Heritage SRS: Two Phases

Legislation directs us to "conduct a special resource study of resources related to the maritime heritage of the State."

Phase One: Deciding which resources to study, surveying resources, and analyzing results

Phase Two:

A. Determining if resources qualify for inclusion in the National Park System
B. Drafting a set of other management alternatives for protecting and interpreting resources
C. Collecting public feedback on the alternatives
D. Deciding which is the most efficient and effective alternative
E. Forwarding a recommendation to Congress

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Michigan Maritime Heritage Special Resource Study

Phase One:

Deciding which resources to study, surveying resources, and analyze results

The study legislation asks us to "establish the potential for interpretation and preservation of maritime heritage resources" and "address...increasing public awareness and access"

• To establish the potential for interpretation and preservation, we needed to understand how resources are already interpreted and preserved and to what degree.

• To address increasing public awareness and access, we needed to determine the current levels of awareness and access.

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Michigan Maritime Heritage Special Resource Study

Phase One:
Deciding which resources to study, surveying resources, and analyze results

Defined "maritime heritage resources" as historic resources that are present because of their coastal location, and derive their significance from contributions to Michigan's maritime heritage.

Researched a list of resources and related preservation/interpretation programs

Surveyed the resources - our goal was to develop maps and assess degree of preservation and interpretation from a "layperson" perspective (mystery shopping). Only surveyed resources publically accessible in some way (e.g. no private residences).

Developed a database of 270 heritage resources, 269 support resources

Drafted a report summarizing our findings and quantifying some trends we observed (The final version of this report will be a chapter in the full SRS)

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Michigan Maritime Heritage Special Resource Study

Phase One:
Deciding which resources to study, surveying resources, and analyze results

Heritage Resource: An historic resource deriving its significance from contributions to Michigan's maritime heritage. Examples: lighthouses, ore docks, historic harbors and marinas, museums focused on collecting and/or interpreting elements of maritime history.

Support Resource: A resource (either historic or non-historic) providing infrastructure for visitors to experience heritage resources, either by placing the resources in their broader historic context, or by affording visitors the ability to directly interact with the sea or coastline.

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Michigan Maritime Heritage Special Resource Study

Phase One:
Resource Types

INDUSTRY

Fishing - Commercial
Fishing - Recreational
Mining - Company Towns
Mining - Docks
Mining - Other
Transportation - Bridges
Transportation - Other
Recreation - State/National Parks
Recreation - Local Parks/Conservancies
Recreation - Private Attractions
Recreation - Resorts/Hotels
Recreation - Marinas
Recreation - Other
Shipping
Lumbering - Communities
Lumbering - Docks
Governance/Military/ Public Infrastructure
Other

NAVIGATIONAL AIDS

Fog Signal
Buoys/Daymarks
Locks/Canals
USCG/USLSS Station
USCG Boathouse
USCG Quarters
USCG Dock
USCG Other Structures

WATERCRAFT

Boatbuilding
Cruise/Tour
Freight
Private
Ferry
Fishing
Military/Rescue
Shipwrecks
Other

CULTURAL

Museum
Gathering
Music and Arts
Storytelling
Ephemera
Walking Trail/Boardwalk

LIGHTS

Lighthouse or Lighthouse Complex
Keepers Quarters
Oil House

HARBORS

Natural
Manmade

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Michigan Maritime Heritage Special Resource Study

Phase One:
Data Collected

Identified **270** Heritage Resources, **269** Support Resources

We surveyed **261** of these resources in person

Collected information on

- Resource type and features
- Hours/seasons of operation and accessibility
- Interpretive signs and programs
- National register/other designation signage
- Brochures and wayfinding signage
- GPS data points
- "Programs" like Circle Tour, Great Waters, Heritage Routes, etc.

Results: Graphs, tables, maps, case studies illustrating trends, points of contrast, and challenges we observed

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Michigan Maritime Heritage Special Resource Study

Phase One: In Depth

Maritime Heritage Tourism Programs

We have hired a researcher to help us answer questions about existing programs for connecting, interpreting, and/or promoting maritime resources. This part of the study is in process.

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs

1. West Michigan Pike
2. The Sweetwater Trail
3. Michigan DOT Heritage Routes
4. Great Lakes Circle Tours
5. Great Waters
6. Port Cities Collaborative
7. Keweenaw County Historic Signage
8. Michigan Heritage Water Trails
9. Lake Michigan Water Trail
10. Other programs?

History • Goals • Maritime Aspects • Partners • Costs • Longevity • Effectiveness

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
1. West Michigan Pike

- Agitation by automobile and bicycle enthusiasts for improvement of treacherous road conditions
- West Michigan Pike established 1911, construction completed by 1922
- Linked with Dixie Highway in 1923, absorbed into Federal Highway System in 1926 (US-31)
- Efforts by Pure Michigan and Michigan Beachtowns to revive West Michigan Pike as tourist destination began in 2008

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
2. Sweetwater Trail

- Tourism initiative established in 1992 by Michigan Historic Preservation Network to increase public appreciation of Michigan's connection with Lakes (single person effort)
- Several maps planned displaying coastal routes in Eastern Upper Peninsula and northeastern Lower Michigan with corresponding signage along routes
- Eastern Peninsula and Huron Shore map published in 1998, available in region
- Signage still visible at some sites along this trail though program is inactive

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
3. Michigan DOT Heritage Routes

- Established in 1993 to "ensure that the rich heritage of local highways and roadsides continues to play an important role in improving Michigan's economy and quality of life."
- Currently sixteen Heritage Routes (four in Upper Peninsula, twelve in Lower); six Recreational, five Scenic, five Historic
- Formal application process, routes must have sponsoring organizations responsible for stewardship and a management plan

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
4. Great Lakes Circle Tours

- Great Lakes Commission: compact of eight states plus Ontario and Quebec
- Effort to identify closest continuous route along shorelines – state trunk lines
- Each state appoints three commissioners, works with DOT and other organizations
- Signage placed at strategic locations, no specific emphasis on maritime heritage
- No funding at the moment, plans for web-based promotion/GIS mapping if funded

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
5. Great Waters

- Regional tourism effort to join Upper Peninsula communities to market area as tourism destination
- Three trails in Upper Peninsula featuring parks, forests, campgrounds, recreational areas
- Thirty-three natural and cultural attractions
- Active web promotion (Facebook, Youtube)

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
6. Port Cities Collaborative

- First Port Cities Collaborative meeting in 2007 to share best practices among port cities, address funding and policy issues
- Became 501 c.3 in March 2011, with a Board of Directors split among Upper and Lower Peninsulas
- Successful at generating networking among communities to promote unique coastline of state
- Currently self-sustaining through meeting fees
- Plans to expand, launch website, show port cities have more to offer

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
7. Keweenaw County Historic Signage

- "Rustic sign program" started in 1930s for motorist guidance
- Intended to highlight historic points of interest throughout Keweenaw County
- Created and managed by Keweenaw County Road Commission – dedicated sign shop
- New collaborative signage program rolled out June 2011 – Keweenaw National Historical Park, Keweenaw Heritage Sites – over 100 signs in four counties

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
8. Michigan Heritage Water Trail

- First suggested in 1998 as a recreational trail; Repackaged as educational trails highlighting historic/cultural/environmental amenities
- Pilot water trails in 2004; several completed
- Sponsored signage regarding riparian and maritime history
- Program never funded, but template still exists for future water trails

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
9. Lake Michigan Water Trail

- National Recreational Water Trail – established June 4, 2011
- Effort dating back a decade – Northeast Illinois Paddling Association
- Lake Michigan Water Trail Association and NPS are the major partners
- No major funding allocated, mostly a volunteer effort using existing infrastructure
- Not specifically heritage-focused

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Michigan Maritime Heritage Special Resource Study

Maritime Heritage Tourism Programs:
10. Other Programs?

A. Michigan Historical Marker program
B. Regional historic signage programs
C. Michigan Sea Grant involvement
D. Any others?

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Michigan Maritime Heritage Special Resource Study

Phase Two

A. Determining if resources qualify for inclusion in the National Park System
B. Drafting a set of other management alternatives for protecting and interpreting resources
C. Collecting public feedback on the alternatives
D. Deciding which is the most efficient and effective alternative
E. Forwarding a recommendation to Congress

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Michigan Maritime Heritage Special Resource Study

Phase Two: A
Determining if resources qualify for inclusion in the National Park System

- 10 currently designated NHLs in Michigan are maritime-related
- 6 more potential NHLs are maritime-related (determined by the SHPO to be on, or eligible for, the NRHP at the national level of significance)
- Question: Can 16 out of 270 resources be considered representative of Michigan's maritime heritage?

Phase One: Deciding which resources to study, surveying resources, and analyzing results

Phase Two:

A. Determining if resources qualify for inclusion in the National Park System
B. Drafting a set of other management alternatives for protecting and interpreting resources
C. Collecting public feedback on the alternatives
D. Deciding which is the most efficient and effective alternative
E. Forwarding a recommendation to Congress

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

Phase Two: B
Drafting a set of management alternatives for protecting and interpreting the resources

- Researched preservation and interpretation programs for similar resources
- As a team, weighed the pros and cons of these existing programs in terms of meeting these goals:
  - ✓Sustainable funding
  - ✓Coordinated administration of varied resources and programs
  - ✓Promotion of resources
  - ✓Consistent program design
  - ✓Technical support and assistance
  - ✓Partnership building
  - ✓Mechanisms to preserve resources

Phase One: Deciding which resources to study, surveying resources, and analyzing results

Phase Two:

A. Determining if resources qualify for inclusion in the National Park System
B. Drafting a set of other management alternatives for protecting and interpreting resources
C. Collecting public feedback on the alternatives
D. Deciding which is the most efficient and effective alternative
E. Forwarding a recommendation to Congress

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

Phase Two: C
Collecting public feedback on the alternatives

- Starting with you!
- General public in late winter or early spring

Phase One: Deciding which resources to study, surveying resources, and analyzing results

Phase Two:

A. Determining if resources qualify for inclusion in the National Park System
B. Drafting a set of other management alternatives for protecting and interpreting resources
C. Collecting public feedback on the alternatives
D. Deciding which is the most efficient and effective alternative
E. Forwarding a recommendation to Congress

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

Phase Two: D
Deciding which is the most efficient and effective alternative

- After taking public feedback into account, likely in Spring 2012

Phase One: Deciding which resources to study, surveying resources, and analyzing results

Phase Two:

A. Determining if resources qualify for inclusion in the National Park System
B. Drafting a set of other management alternatives for protecting and interpreting resources
C. Collecting public feedback on the alternatives
D. Deciding which is the most efficient and effective alternative
E. Forwarding a recommendation to Congress

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

Phase Two: E
Forwarding a recommendation to Congress

- After public and internal reviews
- Tentatively winter 2012/2013

Phase One: Deciding which resources to study, surveying resources, and analyzing results

Phase Two:

A. Determining if resources qualify for inclusion in the National Park System
B. Drafting a set of other management alternatives for protecting and interpreting resources
C. Collecting public feedback on the alternatives
D. Deciding which is the most efficient and effective alternative
E. Forwarding a recommendation to Congress

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

Our Preliminary Alternatives

A. No New Action

B. Upper Great Lakes Trading and Shipping National Historic Trail

C. Michigan Maritime Heritage Preservation and Interpretation Program

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

A. No New Action

- Maritime resources in national, state, and local parks would continue to be protected and interpreted
- NPS would continue to provide technical support for NHLs and assistance to those who apply for federal surplus lighthouses and other federally-owned historic properties
- The heritage resources identified in our survey would continue to be managed by a variety of entities and in a variety of ways. The vast majority of those resources are currently publically accessible in some way, stable, and under responsible stewardship.
- Coordination between maritime heritage resources – non-profits like the MI Historic Preservation Network, the MI Lighthouse Conservancy, and the Maritime Heritage Alliance

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

A. No New Action

Maritime Heritage Tourism Programs

1. West Michigan Pike
2. The Sweetwater Trail
3. Michigan DOT Heritage Routes
4. Great Lakes Circle Tours
5. Great Waters
6. Port Cities Collaborative
7. Keweenaw County Historic Signage
8. Michigan Heritage Water Trails
9. Lake Michigan Water Trail
10. Other programs?

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U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

B. Upper Great Lakes Trading and Shipping National Historic Trail

Concept:
A collection of historic trading and shipping routes connecting hundreds of maritime heritage resources that served (and, in many cases, continue to serve) this engine of commerce. The National Park Service would administer the NHT. Partners (other federal and state agencies, local governments and nonprofit organizations) would work with NPS through formal agreements.

Note that there is a specific process we need to follow in order to propose this as an alternative which includes identification of a nationally-significant route and approval from NPS at the Washington level.

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

B. Upper Great Lakes Trading and Shipping National Historic Trail

How it would work:

- The National Park Service would administer the NHT through partnerships
- Trail administration would involve: Identification/recognition of trail and sites, grants, technical assistance, cooperative planning, recognition, advocacy
- Very little, if any, direct NPS resource ownership and management
- Note: would only directly impact resources contributing to the trail, not all maritime resources

Again, we need approval in order to include this in our range of alternatives.

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

C. Michigan Maritime Heritage Preservation and Interpretation Program

Concept:

A Program led by NPS staff housed at various locations in Michigan (a central location and coastal park locations in the Upper and Lower Peninsulas). Staff would work closely with history programs at the state level to provide the structure for a comprehensive preservation and interpretation program for Michigan maritime heritage resources.

National Park Service
U.S. Department of the Interior

Michigan Maritime Heritage Special Resource Study

C. Michigan Maritime Heritage Preservation and Interpretation Program

How it would work:

- NPS staff in various Michigan location would lead program, working in collaboration with history programs at the state level
- All "maritime heritage resources" as defined by the program could be affected by this program
- Provide technical preservation support
- Help interpretation through assistance developing materials, uniform graphic standards
- Manage a grant program supporting National Register nomination, other preservation and interpretative purposes
- Conduct thematic studies and write multiple property nominations to the National Register

Thank you!

Question and Answer Session

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Midwest Region
National Park Service
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	National Recreation Trail	National Historic Trail	National Scenic Trail
What are they?	NRT is a designation that recognizes existing trails that provide a variety of outdoor recreation uses in or reasonably accessible to urban areas.	NHTs commemorate historic (and prehistoric) routes of travel that are of significance to the entire Nation.	NSTs are 100 miles or longer, continuous, primarily non-motorized routes located to provide maximum outdoor recreation potential and for the conservation and enjoyment of nationally significant scenic, historic, natural, or cultural qualities.
How are they designated?	Existing trail designated by the Secretary of Interior or the Secretary of Agriculture	Authorized by an act of Congress	Authorized by an act of Congress
What is their importance?	Regional or local	National significance	Outstanding recreation opportunity, nationally significant scenic, historic, natural, or cultural qualities (when compared with other trails nationally).
What are the eligibility requirements?	Must be a trail (travelway established by construction or use) passable by at least one method (foot, bike, ATVs, etc.) but cannot be a roadway. There are no length requirements.	100+ miles in length, although shorter NHTs are allowed. Along NHTs, designation shall be continuous, but not development or preservation.	100+ miles in length.
What are the criteria?	• The trail must be open to public use and be designed, constructed, and maintained according to best management practices. • The trail is in compliance with applicable land use plans and environmental laws. • The trail will be open for public use for at least 10 consecutive years after designation. • Designation must be supported by the landowner(s) whose property the trail crosses.	• Significance a. Actual route of historic use, well enough documented to be located. b. National significance with respect to any of several broad facets of American history (e.g. trade and commerce, exploration) and have had a far reaching effect on broad patterns of American culture. c. Significant potential for public recreation and/or interpretation. • Desirability – The study must analyze proposed routes, land use, etc. • Feasibility – Whether it is physically possible to develop a trail, financial feasibility.	• Desirability – The study must analyze proposed routes, land use, etc. • Feasibility – Whether it is physically possible to develop a trail, financial feasibility.

National Trail Type Comparison Chart

How many are there?	About 1,100 nationwide (21 in Michigan)	19	11
In general, how do they work?	Trails remain owned, operated, managed, and administered by their pre-designation entity(s). Access to technical assistance through NRT program partners. The Forest Service administers NRTs within national forests. NPS is responsible for the overall administration of the NRT program on all other lands, including coordination of non-federal trails.	When designated, the trail is assigned for administration to a federal agency (NPS, USFS, etc.) Agencies exercise trail-wide administrative responsibilities (e.g. coordinating agencies and partner organizations in planning, resource protection, and interpretation). On-site management by various government and private entities that own or manage lands along the trail. Management responsibilities include inventorying and mapping, planning and development of trail segments or sites, etc.	When designated, the trail is assigned for administration to a federal agency (NPS, USFS, etc.) Agencies exercise trail-wide administrative responsibilities (e.g. coordinating agencies and partner organizations in planning, resource protection, and interpretation). On-site management by various government and private entities that own or manage lands along the trail. Management responsibilities include inventorying and mapping, planning and development of trail segments or sites, etc.
What funding opportunities are available?	• Eligible to be considered for support from the National Park Service Challenge Cost Share Program, Bureau of Land Management, and USDA Forest Service Challenge Cost Share Programs. • Funding for trails through the Federal Highways Administration that states disburse, encourages additional consideration for NRTs, NSTs and NHTs.	• Federal funding for trail administration. The National Trails System Act does not provide for sustained funding of designated trails operations, maintenance and development, nor does the Act authorize dedicated funds for land acquisition. • Funding for trails through the Federal Highways Administration, that states disburse, encourages additional consideration for NRTs, NSTs and NHTs. • Along NHTs, only lands associated with "high potential" segments may be federally acquired.	• Federal funding for trail administration. The National Trails System Act does not provide for sustained funding of designated trails operations, maintenance and development, nor does the Act authorize dedicated funds for land acquisition. • Funding for trails through the Federal Highways Administration, that states disburse, encourages additional consideration for NRTs, NSTs and NHTs.

Sources: The National Trail System Act (as amended), NPS National Trail System (www.nps.gov/nts), American Trails (www.americantrails.org)

emergence and growth of an urban region

THE DEVELOPING URBAN DETROIT AREA

7.30.15

Note:

The Late FRANK Ogden, TORONTO FUTURIST, Forecast The draining of Lake Erie - Others have advocated same.

emergence and grov of an urban region

THE DEVELOPING URBAN DETROIT /

VOLUME 1: ANALYSIS

Part One of a Study Directed by

CONSTANTINOS A. DOXIADIS

The Developing Urban Detroit Area Research Prc been undertaken by The Detroit Edison Company in c tion with Wayne State University, Detroit, and Doxiad ciates of Athens, Greece, for the purpose of providing gu for the growth of Detroit Edison, serving the needs of p authorities and of all who are concerned with the advai of human as well as economic values.

Research into the growth patterns, potentialities an requirements of the Urban Detroit Area was first prop Walker L. Cisler, Chairman of Detroit Edison, a man throughout the world for his continuing work in ene power, economic development, public service and ed On many occasions in the early 1960's, Mr. Cisler discu value of a thorough long range study of this area with I stantinos Doxiadis, world-famous engineer, architect a ner of urbanization, and old friend with whom he had during the period of economic assistance to Greece u Marshall Plan.

Both men agreed that nations and cities must have understanding of the complex problems presented by p ena of population increase, patterns of urban developn economic growth, all of which are closely interrelated.

As Chairman of the Board of the Athens Techr Institute and as President of Doxiadis Associates, a firm sultants on development and ekistics, Dr. Doxiadis enc the project because it provided the opportunity to a talents of his organization to a developed area of th where there are physical and human potentialities for r unusual development.

In January, 1965, therefore, began the research 23,059-square-mile Urban Detroit Area, defined for pose as a 25-county segment of southeastern Michig counties in northern Ohio, and three counties in wester io, Canada.

The research project will continue through thre taking five years to complete. Part I is concerned prima an analysis of existing ekistic conditions, "ekistics" the new science of human settlements. Part II will pres natives for projecting trends into the future. Part III v pret the findings of Parts I and II to provide an impro for planning to meet future growth objectives in th Detroit Area.

This volume presents the results of Part I, the which have been to analyze the nature and magnitude growth in the area influenced by Detroit, and to under many problems created by extensive and dynamic devel

Although this study is primarily an analysis of th Detroit Area, its patterns of development and the p created have been affected by conditions and develop

(continued on b

the entire Great Lakes area, and in all of North America that reason, each of these geographic areas is examined i volume.

Cities throughout the world are experiencing proble ekistic development. EMERGENCE AND GROWTH O URBAN REGION is essentially a report on economic physical forces at work and as such becomes a necessary ence book for all who are concerned over the future en ment of the human race. Visual presentation of data is extensively for the convenience of the reader.

CONSTANTINOS DOXIADIS is a recognized aut on planning and urban development. Chief Town Pla Officer of Greater Athens Area (1937-1938), he later as Head of the Department of Regional and Town Plann the Greek Ministry of Public Works. From 1945 to 19 served as Minister and Permanent Secretary of Housing R struction and as Minister-Coordinator of the Greek Rec Program.

In 1951 Dr. Doxiadis founded Doxiadis Associate services have been used by the United Nations, the Interna Bank of Reconstruction and Development, the governme Ghana, Greece, India, Iraq, Jordan, Lebanon, Libya, Pal South Vietnam, Spain, Sudan and Syria, as well as by private organizations around the world. Doxiadis is also fo and Chairman of the Board of Directors of the Athens nological Institute and teaches ekistics in its Athens Cer Ekistics.

Lecturer and author, Dr. Doxiadis has been award Sir Patrick Abercrombie prize of the International Uni Architects (1963), the "Cali de Oro" award of the Soci Mexican Architects (1963), the award of excellence Industrial Designers' Society of America (1965), and the award of the Aspen Institute of Humanistic Studies (196 recognition of his distinguished career, several educational tutions have conferred honorary degrees. Among them are by Swarthmore College (1962), Wayne State Uni (1964), Mills College (1964), Northern Michigan Uni (1965), The Detroit Institute of Technology (1966), University of Rhode Island (1966).

The Detroit Edison Com

Preface

For The Detroit Edison Company:

I am very happy to preface a few brief thoughts to the results of Part I of our five-year research into the growth patterns, potentialities and future requirements of the Urban Detroit Area and the many other cities that are participating in the remarkable economic progress that can be foreseen in the southern Great Lakes area. Part II is already under way.

My life work for 44 years has been in the field of energy and power, both at home and abroad. It has been my privilege to work with many people and many nations on energy development and economic growth, beginning during World War II and the immediate postwar period, then under the Marshall Plan and since then through the extension of its principles of assistance literally around the world.

The experience has made me keenly aware of the natural, human and technological advantages that we have in the southern Great Lakes area, advantages that are perhaps unmatched in their totality in almost any other region. Up to the present moment, we have come a long way and yet there is reason to believe that this is only the beginning of a truly extraordinary economic and social growth that will occur in future years.

My endeavors in helping nations to examine their energy resources and future requirements for effective economic progress have taught me the importance of approaching such problems in an orderly way, utilizing the skills of well-versed specialists in gathering the facts, analyzing them, establishing guideposts and setting realistic goals for the future. The same approach can be applied just as effectively to the southern Great Lakes area and to other regions of North America. It is a most effective tool to work with.

I came to know Constantinos Doxiadis in 1948 during the period of economic assistance to Greece under the Marshall Plan. At that time Dr. Doxiadis was coordinator of reconstruction for his nation. Since then he has become world famous as an engineer, architect and planner of urbanization, a man of vision and perspective.

Over the years our paths crossed frequently and we had opportunity to discuss the underlying problems of economic growth and urbanization in a world that was advancing so rapidly in science, technology and engineering and where population was increasing as never before. The urban way of life, involving entire physical and economic regions, was becoming dominant and there was clearly the need to understand and partly guide this growth so that this new environment would be conducive to human happiness and fulfillment. We felt that the future would be different from the past not only in the degree of urbanization but also in form and quality. Valuable planning activities were in progress yet there was a need for bringing matters together more comprehensively and understandingly.

So it was that a few years ago I asked Dr. Doxiadis whether a thorough long-range study of the metropolitan area adjacent to Detroit could be undertaken. It could provide guidelines for the growth of Detroit Edison and others, serving the needs of planning authorities and all who are concerned with the advancement of human as well as economic values.

My friend Dr. Doxiadis responded with enthusiasm because he was quick to recognize in such a project an opportunity to apply the talents of his organization to a developed area of the world that had almost unique potentialities for growth.

We were in turn happy to find that Wayne State University shared our desire to undertake such a comprehensive research project and so it was begun in January 1965. This volume presents

the results of Part I of a three-stage project which we expect to complete by 1970. Results will be made available to all who find them of value to their own endeavor and success.

The cooperation which the project has received from individuals, organizations, institutions of higher learning and government agencies is most inspiring. To me this is most healthy and encouraging because the challenge of the future requires that we all work together for mutually satisfactory results. This is the very strength of a democratic society.

The undertaking is greatly strengthened because of being interstate and international. Counties in Ohio and in the province of Ontario are properly a part of the study area and in the great future which we share and can hopefully shape together.

Walker Lee Cisler
Chairman of the Board
The Detroit Edison Company

For Wayne State University:

When Walker Cisler first suggested that Wayne State University join with Doxiadis Associates and The Detroit Edison Company in a three-phase study of the developing Urban Detroit Area, it seemed to the late Clarence B. Hilberry, then President of the University, a very fruitful project and consonant with the interests of the faculties in urban affairs. Members of the faculties agree that, as a state university, Wayne has the same general responsibility as other complex institutions of higher education to serve knowledge on the national and worldwide scale. Thus, a relationship with Doxiadis Associates of Athens, Greece, presented a rich opportunity for research and planning. As a public university situated at the hub of the fifth largest metropolitan area in the United States, Wayne State has a special responsibility to serve urban needs. Thus, a relationship with the utility company which provides the electric energy for the region has provided a valuable collaboration in education and research. As the result of a number of discussions, Clarence Hilberry joined with Constantinos Doxiadis and Walker Cisler to form the Policy Committee for this joint undertaking.

The role of Wayne State University in such a project is to deploy its resources of students and faculties in the solution of the urgent problems facing Detroit and other cities. The simple fact is that our growth and our needs have extended far beyond our ability to bring them into a fully desirable order. (Planning being done today tends to be in terms of the urban situation that existed twenty-five years ago.) The analysis presented in this first volume clearly demonstrates the necessity of creating new approaches and new multi-disciplinary solutions. The collaboration of the University with Doxiadis Associates and The Detroit Edison Company is one proof of such a new approach.

This publication of Part I, the analysis of the Developing Urban Detroit Area, will be valuable to the people of this region, and it will illuminate comparable problems in similar areas.

A public urban university also has a further responsibility to the people of the immediate area. Since it reaches in many ways into this community through the faculties of its basic colleges and of its professional and graduate schools, it has unusual opportunities to enlist the cooperation and help focus the interest of both public and private organizations. The university has an obligation to create fresh ideas about cultural planning, and about economic and social planning, as well as physical planning. In so doing it is able increasingly to bring the resources of all its intellectual disciplines to bear on helping to create the cities of tomorrow.

William R. Keast
President
Wayne State University

or Doxiadis Associates:

Man has lost today the battle for control of is cities. As a result of this the cities are getting vorse with every day that passes and man is more nd more at a loss on what to do about them—he s in great danger of being tamed by the on-going forces which lead to his sufferings. One of the causes of the confusion on what to do about our cities is the fact that man does not know how to deal with them, especially the larger ones.

Man begins to react today to this situation. A very few enlightened persons like Walker Cisler begin to see the danger and try to face it. This is why Detroit Edison created the "Developing Urban Detroit Area Research Project." It has to answer the grave questions: Where is our city going, what can we do for it? The fact that one great industry of Detroit took the initiative and a great educational institution joined it in this effort is indicative of the recognition of this potential danger for the urban settlement of Detroit.

When the Athens Technological Institute and Doxiadis Associates, dealing with similar problems around the world, were invited to join this project, together with The Detroit Edison Company and Wayne State University, they were very happy to provide their services and experience to those who try to create a better future for Detroit. They also knew that they undertook a very difficult task, without any certainty about the outcome of such a study. It is this lack of certainty—since we know very little—that is the cause of lack of action in most of the great metropolitan areas around the world. Who is so unwise—they ask—to undertake such a superhuman task? But if the task is superhuman, is not the city also going to be an inhuman one?

There is only one way for man to face the crisis and this is by opening his eyes to it—not by burying his head in the sand—understanding it and exploring all possible solutions. To achieve this, I am usually told, requires many years and exposes us to the danger of mistakes.

To the first point there is the answer that we should not wait for many years—we have to try to give solutions now. We have therefore tried to find in one year what happens, and to try and propose solutions within the second year.

Such a schedule increases the danger of making mistakes. That is true, but the mistakes we make every day because we do not face the whole problem are much graver than those we are going to make by not understanding the situation in its details and by not working out the best solution.

We commit ourselves everyday with thousands of decisions that, unless we provide a system to face the future of Detroit as soon as possible, will tie us and our descendants with thousands of chains. To avoid this we undertook to assist in the present study in full knowledge of the dangers present in such an approach, at a time in which humanity knows so little and must act so quickly.

This study is presented as mine but it is not. It is the study of hundreds and thousands of people who carefully followed the phenomena of the Urban Detroit Area and the broader space around it and collected data; it is the study of those who conceived this project and of all of those who carried it out with great enthusiasm and dedication. My role was the one of a technical coordinator of the effort made. Because of this role I am prepared to take the responsibilities for the weaknesses and gaps of composition of the overall picture. To all others we must be grateful for inspiration and for execution.

Constantinos A. Doxiadis
President
Doxiadis Associates

In Appreciation

The Developing Urban Detroit Area Research Project owes much to the generous technical assistance provided by many individuals, organizations and agencies, both in the United States and Canada.

The project staff is most appreciative of data supplied by the Michigan and Ohio Departments of Economic Expansion, by the Ontario Department of Economics and Development, by state and local governmental agencies with jurisdiction in the area studied, and by the many regional, county and local planning groups.

There were frequent occasions when the staff was helped by yet other individuals with a special knowledge of the area. They included Charles A. Blessing, Director, Detroit City Planning Commission; Dr. Edward Pleva, Chairman, Department of Geography, University of Western Ontario; Paul Reid, Director, Detroit Metropolitan Area Regional Planning Commission; and Irving Rubin, Director, Detroit Regional Transportation and Land Use Study.

The staff also had the advantage of advice from several private consulting planning firms, including Crane & Gorwic Associates, Inc.; Geer Associates Planning Consultants, Inc.; Parkins, Rogers & Associates, Inc.; Vilican-Leman & Associates Inc.; and Waring & Johnson.

Drafts of various sections of the manuscript were reviewed by experts close to the subject matter. They were Professor Robert J. Goodman, Department of Geography, Wayne State University; Professor Morton S. Hilbert, School of Public Health, University of Michigan; Dr. George Honzátko, Department of Urban Planning, Wayne State University; George C. Kiba, Manager, Transportation Bureau, Greater Detroit Board of Commerce; Dr. Albert J. Mayer, Professor of Sociology, Wayne State University; James Miller, Assistant Director, Detroit Metropolitan Area Regional Planning Commission; Dr. Wilbur Thompson, Department of Economics, Wayne State University. The critiques so provided were of great assistance in preparing the final text, although the project staff assumes full responsibility for content.

It may be of interest to the reader to know how the project is organized. Broad decision and planning is in the hands of the Policy Committee, the members of which are Walker L. Cisler, William R. Keast and Constantinos A. Doxiadis. For the Policy Committee, E. O. George, Senior Vice-President of The Detroit Edison Company, provides direction and coordination to the project. Dr. Doxiadis directs and supervises technical aspects of the study by means of teams in Athens, Washington and Detroit. Alexander M. Collaros is the Project Manager of the Detroit team.

By arrangement through Dr. James P. McCormick, Vice-President for Student Affairs, Wayne State University has been well represented on the project staff by a number of persons. The project in general, and this volume in particular, have greatly benefited by the generous help and most active participation of Dr. Louis L. Friedland, Associate Dean, School of Liberal Arts. Dr. Friedland coordinated the collection of much of the data, and assisted in its evaluation and interpretation. More specifically, his excellent chapter on "Administrative Structure and Planning Organization" is a major contribution to the report. In addition, he provided invaluable counsel throughout the editing and clarification of text material.

Another contribution which deserves special mention is that of Arthur E. Bush, Manager of Energy Studies, The Detroit Edison Company, for his chapter on "Electrical Energy".

For the abundant illustrations in this volume we are indebted to John T. Liddie, The Detroit Edison Company, and his Graphic Arts Division

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THE DETROIT EDISON COMPANY

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However, it became apparent at the early stages of the study that a clear understanding of the ekistic phenomena within the Detroit Edison service area could not be achieved unless the wider area under the direct influence of the urban Detroit complex was analyzed with the same degree of detail.

To this end, the study area was extended beyond the limits of the Company's service area and covers all such zones which are or would be ultimately influenced by the physical expansion of Detroit's urban development.

On the basis of preliminary investigations, the area of influence was found to extend within Michigan and to northern Ohio as well as to Canada; its boundaries to be at distances from the center of Detroit ranging from 75 to 100 miles.

It is believed that the preliminary definition of the study area was fully justified by the findings of this study. The study area—referred to as the Urban Detroit Area—covers more than 20,000 square miles and comprises 25 of the 83 Michigan counties, 9 counties in Ohio and 3 counties in Ontario, Canada.

Obviously, what occurs in UDA is affected by conditions and developments in the entire Great Lakes area and, indeed, in all of North America. Each of these geographic areas, therefore, is examined, proceeding from the broadest scale by steps down to UDA proper, with increasing definition and analysis along the way.

During the course of study it became apparent that the analysis of major ekistic phenomena in the Great Lakes area called for the examination of still another geographic dimension; namely, the area along the shores of the Great Lakes and St. Lawrence River, which is experiencing a fast rate of urbanization and shows evidence of a megalopolitan development.

On the basis of such considerations this study of the developing Urban Detroit Area addresses itself to four geographic areas of descending size (Fig. 1):

- *The North American Setting*: The continental United States and the southern parts of the provinces of Canada.
- *The Great Lakes Megalopolis*: Mainly the 5 states which constitute the east north central division of the United States plus the western part of Pennsylvania and the northwestern corner of New York along with a zone of the provinces of Ontario and Quebec contiguous to the Great Lakes and the St. Lawrence Seaway.
- *The Great Lakes Area*: The 5 states of the east north central division of the United States plus part of the province of Ontario, contiguous to the Great Lakes, as well as parts of Pennsylvania and New York contiguous to Lakes Erie and Ontario.
- *The Urban Detroit Area (UDA)*: The area of immediate influence of Detroit, which extends roughly within a 100-mile radius from the city. This area extends over 25 counties of southeastern Michigan, 9 counties of northern Ohio and 3 counties in Ontario, Canada.

APPENDIX I. Ekistic Grid: Classification of Ekistic Units

Appendix Fig. I—1

Ekistic Grid

COMMUNITY SCALE	I	II	III	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EKISTIC UNITS	MAN	ROOM	DWELLING	DWELLING GROUP	SMALL NEIGHBORHOOD	NEIGHBORHOOD	SMALL TOWN	TOWN	LARGE CITY	METROPOLIS	CONURBATION	MEGALOPOLIS	URBAN REGION	URBANIZED CONTINENT	ECUMENOPOLIS
ELEMENTS: NATURE															
ELEMENTS: MAN															
ELEMENTS: SOCIETY															
ELEMENTS: SHELLS															
ELEMENTS: NETWORKS															
SYNTHESIS															
POPULATION T (Thousands) M (Millions)	1	2	4	40	250	1.5T	7T	50T	300T	2M	14M	100M	700M	5,000M	30,000M

Ekistic Logarithmic Sc

Note: Later on, Doxiadis advocated the scheme of Ekumenokipos or "World Garden" for the Great Lakes!

emergence and growth of an urban region

THE DEVELOPING URBAN DETROIT AREA

VOLUME 2: FUTURE ALTERNATIVES

A study directed by

CONSTANTINOS A. DOXIADIS

a project of

The Detroit Edison Company **Wayne State University**

Doxiadis Associates

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emergence and growth of an urban region

THE DEVELOPING URBAN DETROIT AREA

VOLUME 2: FUTURE ALTERNATIVES

A Study Directed by

CONSTANTINOS A. DOXIADIS

In January 1965 a long-range comprehensive study of the dynamic Urban Detroit Area was undertaken by The Detroit Edison Company in cooperation with Wayne State University of Detroit and Doxiadis Associates of Athens, Greece.

The purpose of the "Developing Urban Detroit Area Research Project" is to analyze, understand and explore the growth patterns, potentialities and future requirements of the major urban area influenced by Detroit which comprises 37 counties in southeastern Michigan, northern Ohio, and southwestern Ontario.

From this in-depth study initiated by Detroit Edison will come guidelines for planning authorities and others concerned with the advancement of human as well as economic values. A corollary purpose is to derive a comprehensive framework for expanding the facilities of The Detroit Edison Company to meet the increasing requirements for electric energy.

The findings of the first phase of the study were presented in Volume 1, *Analysis*, in which the nature and magnitude of urban growth in the Urban Detroit Area were analyzed and examined within the wider frame of the entire Great Lakes area and the North American setting.

This volume, *Future Alternatives*, presents the results of the second phase of the study in which alternative patterns of development for UDA were studied, classified, evaluated and selected on the basis of projections up to the year 2000.

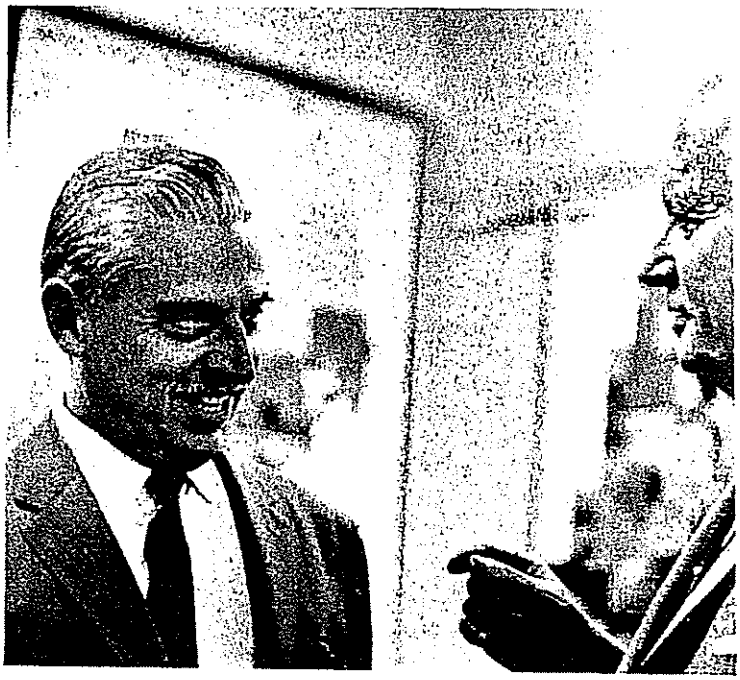
The third phase of the study to be completed by 1970 will elaborate on and interpret the findings of the preceding phases of the study so as to provide an overall basis for the development of UDA.

The methodology presented in this volume is the first attempt at the study of alternative patterns of development to provide a comprehensive framework for comparisons and for selection of the optimum solution. To present alternative solutions for such a complex problem within one year of its analysis is a much more challenging task than that of presenting the overall problem. By so doing, however, the way is opened to a profitable discussion on methodology and its application in as wide a circle as possible.

(continued on back flap)

This volume starts a process toward the answer t problems of urban growth in a systematic and order evolution of methods and application will continue as human settlements present such grave problems today.

The basic patterns and problems of ekistic develop Urban Detroit Area are essentially those of other cit out the world. As such, this study becomes necessar for those who are concerned with the future environ human race.



Constantinos A. Doxiadis with Walker L. Cisler, Chair Board, The Detroit Edison Company.

CONSTANTINOS A. DOXIADIS is a recognized a planning and urban development. His services have by the United Nations, the International Bank for R tion and Development, the International Cooperation tration, the Ford Foundation, the Agency for Int Development, the Redevelopment Land Agency of W D. C., the governments of more than twenty countri as by many cities and private organizations around

Dr. Doxiadis has been elected to many distinguished p profession and has received numerous awards and d for his accomplishments, as well as honorary degrees. he is President of Doxiadis Associates and Chairm Board, Athens Technological Institute.

He is author of many monographs and the following English: *Architecture in Transition; The New World Man* (with T. B. Douglass); *Urban Renewal and the the American City; Between Dystropia and Utopia;* other publications. *Ekistics, An Introduction to the S Human Settlements,* and *Building Our Cosmos* published.

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Glossary of Selected Terms

Accessibility model: A mathematical model for the distribution of population among the subregions of a study area based on the concept of accessibility. It is also referred in the text as population distribution model.

Alternative: Refers to the alternative conceptual development patterns for the study area by the target year. It can be thought of as a point in the many-dimensional parameter space of the urban system.

Basic employment: The percentage of total employment of the urban system initially specified and considered as a major directional force conditioning the structure and form of an urban area. It is used as an input variable to the accessibility model for the population distribution.

Calibration: Determination of the best values of parameters in the various relationships comprising the model so that the model describes as closely as possible historic situations and events of the type it is intended to simulate.

Community class: Based on a systematic classification of human communities expressed in the Ekistic Logarithmic Scale (ELS), starting from Class I which corresponds to the building group and ending with Class XII corresponding to Ecumenopolis.

Concentric zones: Subdivision of the urbanized areas of UDA into concentric rings, the boundaries of which coincide with township, city, county or census tract boundaries.

Continuously Increasing Dimensionality method (CID): The process of the gradual increase of scale in the application of the IDEA method, in order to permit the introduction of more dimensions in the search for the best alternative.

Desirable density: Used in this book to denote the density distribution pattern over the study area obtained by the application of the accessibility model. It represents the desire of the population to reside as close to work as possible.

Dimension: Used to represent the various factors, referred to as parameters in the text, that influence the alternative development patterns of an urban region.

Directional forces: The forces of attraction or repulsion that exist in or around human settlements and influence their structure, form and pattern of development.

Ecumenopolis: The coming city that will, together with the corresponding open land which is indispensable for man, cover the entire earth as a continuous network of urbanized areas forming a universal settlement.

Ekistics: The science of human settlements which conceives the human settlement as a living organism with its own laws and develops the interdisciplinary approach for solving its problems. The principal concerns of Ekistics are:

- Creation of the most satisfactory environment for human activities.
- Selection of the most efficient means of creating this environment in a given local, regional, national or international setting.

Ekistic Logarithmic Scale: Classification of settlements according to their size presented on the basis of a logarithmic scale, running from man as the smallest unit of measurement to the whole Earth. The Ekistic Logarithmic Scale can be presented graphically, showing area or number of people corresponding to each unit, etc., so that it can be used as a basis for the measurement and classification of many dimensions in human settlements.

Ekistic unit: Based on classification of parts or whole human settlements, starting from unit 1 corresponding to man and ending with unit 15 corresponding to Ecumenopolis. From unit 4 which corresponds to community class I to unit 15 which corresponds to community class XII, the Ekistic units coincide with the classification of human communities expressed in the Ekistic Logarithmic Scale (ELS).

Endogenous: Refers to variables the values of which are determined within the model, as for example secondary employment.

Exogenous: Refers to variables the values of which are determined externally and supplied to the model, as for example basic employment.

Force-mobile: The interplay created by all forces which act and evolve in the study area. A heuristic model based on the force-mobile created by the interaction of the major functions was developed and used for the evaluation of alternate locations of these functions.

Friction factors: Coefficients entering the accessibility model for population distribution and the gravity model for trip distribution, and expressing the traveling habits of the inhabitants of the urban system as a function of travel time.

Functions: All types of activities within a human settlement, such as industrial functions, research and education functions as distinct from *structure*, such as industrial zone, university campus.

Gravity model: A transportation model for the distribution of movements among the zones of the study area. The name "gravity model" is derived because of its analogy to Newton's law of gravitational interaction.

Heuristic: Approaches to analysis and model-building which are largely descriptive and phenomenological and do not delve deeply into the detailed nature of underlying processes.

Independent variable: A data category which is felt to be the cause rather than the effect of a particular process, and is, therefore, considered as an input variable rather than an output variable with reference to a relationship describing the process. Conversely, a dependent variable is a data category which is considered to be an effect of a particular process, and is, therefore, considered to be an output variable of the relationship in question.

Isolation of Dimensions and Elimination of Alternatives method (IDEA): The gradual isolation of dimensions and the selection, by elimination, of the alternatives, conceived along the isolated dimensions, that satisfy certain ekistic criteria. It is an attempt to eliminate the arbitrariness in the search of the many-dimensional parameter space of the urban system for the optimum alternative.

Iteration: The process of convergence to the solution of a problem by successive approximations. It is often used in mathematical models because of the lack of a direct approach.

Man: Term with many meanings depending on the discipline concerned. Used in this book to indicate the individual with his own characteristics and problems as distinct from society.

Matrix of alternatives: A two-dimensional representation of the alternatives. The rows represent values assumed for parameters referring to people and their movements, and the columns represent values given to parameters related to the various functions.

Megalopolis: Greater urbanized area resulting from the merging of metropolises and cities into one urban system. Term used since ancient Greece when Megalopolis was created in Arcadia, but it was then a small city. Its population is calculated in tens of millions. It is distinct from the metropolis, either because its population exceeds ten million people, in which case it also covers a vast surface area, or because it has incorporated more than one metropolis. Jean Gottmann gave a special meaning to this ancient term in 1961 in his book *Megalopolis, the Urbanized Northeastern Seaboard of the United States,* a 20th Century Fund Study, The M.I.T. Press, Massachusetts Institute of Technology, Cambridge, Mass., 1961.

Metropolitan network: The network that serves mainly long intracity movements.

Model: A systematic method, based on logical or mathematical relationships, for describing, simulating, and forecasting real-life processes.

Nature: Term with many meanings depending on the discipline concerned. Used in this book to indicate the natural environment of man as it exists before he starts remodeling it by cultivation or construction. It provides the foundation upon which the settlement is created and the frame within which it can function.

National network: The network which serves mainly long-distance intercity travel along few selected corridors of national importance.

Networks: Term with many meanings depending on the discipline concerned. Used in this book to indicate man-made systems which facilitate the functioning of the settlement, such as roads, water supply, electricity.

Parameter: A quantity which is part of a mathematical relationship and is either constant in value or takes one of a number of specified values.

Permissible density: Used in this book to denote the density distribution pattern over the study area obtained by the assignment of density values to various ratings of natural characteristics, such as topography and scenic attractiveness, on a zonal basis. It represents the density constraints imposed by the characteristics considered.

Rating procedure: The comparative evaluation of the alternatives based on criteria derived mainly from the ekistic elements of nature, man, society and the urban structure.

Regional network: The network that serves mainly intercity travel of regional character.

Saturation density: A density ceiling introduced in the formalism of the accessibility model as an upper limit not to be exceeded by any zonal density.

Secondary employment: The percentage of total employment assumed to depend on the population distribution and therefore set proportionally to the zonal population.

Shells: Term with many meanings. Used in this book to indicate all types of structures within which man lives and carries out his various functions.

Simulation: Literally this word means imitation, and most simulations are imitations of real world processes either through a mechanical analog or through a mathematical model and the operation of a computer process.

Society: Term with many meanings depending on the discipline concerned and also on different schools of thought. Used in this book to indicate human society with all its characteristics, needs and problems, where every individual is examined only as one unit of it.

Solution: Refers to a family of alternatives with some common characteristics.

Standard Metropolitan Statistical Area (SMSA): As used by the Bureau of the Census to mean a county or a group of counties containing at least one city with 50,000 inhabitants or more and having economic and social relationships with contiguous counties of a metropolitan character.

Steps: The successive phases of the elimination of alternatives process carried out by steps taken in the many-dimensional parameter space of the urban system in accordance with the IDEA-CID method.

Texture forces: Forces that exist in human set ments, which spread around certain points, lin areas or volumes and cannot be expressed as rectional ones. They influence their structure a form but mainly their density and size.

Urban areas: Areas of an almost completely url character, with overall density of 1,000 persons more per square mile.

Urbanized areas: As used by the Bureau of Census to mean a conurbation containing one more central cities, with 50,000 inhabitants more, as well as the remainder area or the url fringe which consists either of incorporated pla of at least 2,500 inhabitants or 100 housing u or of unincorporated areas with a density of 1,(inhabitants and over per square mile.

Urban network: The network that serves ma medium and short intracity trips.

Urban system: An urban area selected for anal and projections of various phenomena, and wl can be thought to a good approximation as b isolated from external influence.

Zones or study units: Convenient sub-division UDA into units of study for the examination comparison of the various phenomena and the plication of mathematical models.

CANADA'S WATER: FOR SALE?

RICHARD C. BOCKING

the Dams and through every shade of opinion in between, everyone has had something to say about diverting Canada's water resources. But this is the first time anyone has pulled all the pieces of the debate together, and given us a clear picture of the realities of water distribution on this continent — who wants it, who needs it, and who looks as though they're ready to give it away.

Richard Bocking challenges some current assumptions about our most vital natural resource — like the myth that the U.S. desperately needs Canadian water, and the Canadian belief we can afford to disrupt what appears to be a boundless supply of water.

He sets out the facts which show that Canada has already set out on the road that will almost inevitably lead to massive water exports to the U.S.

He reports on the real outcome of the Columbia River experience, and documents the chilling indications that Canadians are about to repeat that pattern — in the North, on the Churchill River, at James Bay.

He contends that there are alternatives, and makes the case for a new water policy which would deal with pressures coming from the U.S. and with the future of our land and our water in Canadian terms.

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in. Such information is now accumulating gradually, but it is noticeable that it is not those responsible for authorizing or building the projects that are carrying out the studies. Typically, in fact, these agencies discount the validity of such evidence, and have done little to date to incorporate the results of research apart from the field of engineering, into their planning of new projects. This stands as a strange phenomenon indeeed when what is involved is the extremely rapid and permanent restructuring of vast areas of the world, and a complete disruption of some of our most important natural systems.

Our experience so far in water development has been with relatively simple projects, yet we have seen the unexpected repercussions from one-dam projects such as the Bennett Dam on the Peace River. It is evident that the scale on which we can expect complications to arise when dealing with a whole system of dams, diversions and canals as proposed in many regions of Canada would increase if only as a result of normal mathematical permutations and combinations. Additionally, however, through our complex strategies we are probably removing most of the natural resilience of a river system by which it can absorb some change and adjust to some level of abuse. We are proposing completely engineered systems, and we simply have no idea whether or not they will work, or for how long. We do know, however, that the present arrangement works very well, and can be expected to do so indefinitely. We might consider working with these natural systems rather than striving for the elimination of them.

Chapter 5

NAWAPA: dream or fact?

At a cost of one hundred billion dollars, the biggest public works program in history! Half a dozen dams about 1500 feet high, with the biggest more than 1700 feet, twice the height of any existing dam in the world! A reservoir in the Rocky Mountain Trench of British Columbia 500 miles long, 16 times larger in capacity than North America's largest manmade lake! A shipping canal crossing the prairies from the Great Lakes, perhaps even continuing to Vancouver, realizing at last the dream of a Northwest passage! Fifty different dams, canals, tunnels and reservoirs to move water from Northern Canada and Alaska to thirty three states of the United States, seven provinces of Canada, and three states of Mexico! It's called NAWAPA, the North American Water and Power Alliance, and it is an imaginative product from the drawing boards of the Ralph M. Parsons Company of Los Angeles, one of the world's largest engineering and construction firms.

Such a concept was perhaps inevitable after the 1963 decision of the United States Supreme Court allocating Colrado River water to Arizona in a way that would eventually reduce the amount of water California could take from that river. At any rate, in the spring of the following year, the Parsons firm launched its NAWAPA plan into a climate of opinion in the American Southwest that was ready to look at any way out of the dilemma posed by this decision. Southern California had always solved its water problems by reaching ever further for water to feed its growth, and here was a plan that made available to the arid Southwest enormous quantities of clear pure water from the north, since "vast amounts of water are pouring unused into northern seas and are irretreivably lost."

Or as the Parsons Company put it: "NAWAPA is a concept developed . . . for collecting excess water of the Northwestern part of the North American continent and distributing it to the water deficient areas of Canada, the United States, and Mexico . . . Water now wasting into the

sea from Alaska, Canada and the Northwestern United States would be collected and stored in an interconnected system of reservoirs at relatively high elevations. By means of a reservoir-canal-river system the water would then be redistributed throughout the continent generating power as it descends to the sea. In addition, NAWAPA would, through its system of interconnecting rivers and canals, provide a network of navigable waterways throughout Canada and much of the United States."

The preparation and publication of the NAWAPA plan (at a cost of over a million dollars, according to Parsons) had immediate and far reaching effect. It was exuberantly praised by politicians and water resource officials in the American Southwest where the major benefits would accrue, and roundly condemned by many Canadians. U.S. Senator Frank Moss of Utah said: "This is a vast project, but we must not be deterred by its size. The challenges ahead are great and it will take just such a program to meet them." Canada's General A.G.L. McNaughton, however, termed NAWAPA, "a monstrous concept, not only in terms of physical magnitude, but also in another and more sinister sense, in that the promoters would displace Canadian sovereignty over the national waters of Canada, and substitute therefor a diabolic thesis that *all* waters of North America become a shared resource, of which most will be drawn off for the benefit of the midwest and southwest regions of the United States, where existing desert areas will be made to bloom at the expense of development in Canada."

There were Americans too who were appalled by the prospect of restructuring the face of the continent for what they considered to be unproven needs, and Daniel Luten of the University of California suggested: "If we must build NAWAPA, let us wait until we know our doom is at hand, and when our last realizable ambition is to amaze future archaeologists."

Amazed future generations certainly would be, for NAWAPA would drown many of the best intermountain valleys in British Columbia. Its central reservoir, a lake 500 miles long in the Rocky Mountain Trench of British Columbia, would inundate one of the nation's better living environments, a region of small farms, wildlife, and great beauty. The waves would roll over Cranbrook and Golden and Prince George and many smaller communities. The transcontinental highways and railroads would be cut. The

sale of Canadian water through NAWAPA or any other plan, means essentially the sale of great areas of the best of Canada's land as well.

NAWAPA might be described as the ultimate logical extension of the North American delight in bigness and our devotion to technology and growth. So it inevitably struck a responsive chord in water resource planners, dam building engineers, many politicians, and a wide assortment of dreamers. In considerable numbers they leaped to their drawing boards and before long a torrent of plans were published. For a few years, redesigning the water resources of the continent was very much in vogue, and maps of North America with penciled-in dams, diversions, canals, reservoirs and pumping stations were seriously discussed wherever water resource people met.

Lewis Gordy Smith, a retired U.S. Bureau of Reclamation engineer living in Denver, Colorado, vigorously promoted his "Western States Water Augmentation Concept" which would reverse the flow of the Liard River and part of the MacKenzie River using a series of dams and pumping stations. The water would be pushed up the Rocky Mountain Trench, passing through the Williston Reservoir behind Bennett dam on the Peace River, a dam which conveniently provides a plug on the Peace River that would otherwise have to be built. Then the northern water would be lifted into the Fraser River and shipped south to the United States. It would be routed either by way of the Fraser and a tunnel under the Cascade Mountains to the Columbia River, or by reversing both the Fraser and the Columbia down the Rocky Mountain Trench into the Kootenay River and on south into an elaborate distribution system serving the western United States.

NAWAPA and the Smith plan were schemes put forth by Americans for the diversion of Canadian water into the United States. But many other export schemes were conceived by Canadians. Professor Edward Kuiper, of the University of Manitoba, for instance, did some calculations that went even further than NAWAPA in designating Canadian water available for export and diversion. Of the 313 million acre feet flowing in the Nelson, Churchill, MacKenzie and Yukon Rivers, he considered it reasonable to divert 230 million acre feet, with probably more than 100 million acre feet of this actually available for export across the border. An example of how such figures are obtained can be

seen in Professor Kuiper's analysis of the MacKenzie River.

"The average flow of the MacKenzie River at Fort Simpson is about 185,000,000 acre feet per year. The downstream riparian requirements in the future are difficult to foresee. There may be extensive oil drilling, there may be other mining developments in the valley, there is a possibility of limited agricultural development, there are some fishing interests in the delta regions. However, the sum total of all such requirements may not be equal to more than say 10,000,000 acre-feet per year. Hence, the flow available for diversion may be estimated in the order of 120,000,000 acre feet per year." Professor Kuiper can see no use at all being made of the Yukon river, where it is, and so suggests that its entire flow of 55,000,000 acre feet could be diverted.

Dr. E. Roy Tinney, another Canadian, put forth an alternative to NAWAPA in 1967 when he was a professor of engineering at Washington State University, and director of that state's Water Research Center. His Central North American Water Project, or CeNAWAP, would take water from the MacKenzie, Churchill, and Nelson Rivers in a diagonal direction from Great Bear Lake through Great Slave Lake, Lake Athabasca, to Lake Winnipeg. It would then branch south into the United States and east into Lake Superior. Tinney suggests his plan would provide 50 per cent more water for export at one third the cost of NAWAPA.

Dr. Tinney subsequently became employed in the Canadian Department of the Environment, Ottawa, where he is vitally involved in planning the use of Canada's water resources. His CeNAWAP plan has, it seems, become a source of embarrassment to him, and he apparently resents references that take it as a serious proposal. Many of those opposed to water export have suggested a sinister situation exists when one of the nation's foremost water authorities is himself the author of a gigantic water export scheme. And proponents of water export continually refer to the scheme, perhaps to enhance the "respectability" of the idea of export. The CeNAWAP plan appears in every list of export possibilities, and it seems particularly well thought of in such states as New Mexico, which would benefit particularly from this plan. Dr. Tinney states that his plan was put forth only to show that a much better scheme than NAWAPA could be devised if necessary, but that he does not personally advocate export of Canadian water to the United States.

Many other schemes were promoted in the 60's, such as

the "Magnum Canal" which would divert water from the Liard River across the prairies via the Peace, Athabasca, North and South Saskatchewan, Qu'Appelle and Souris Rivers into the Missouri. This plan, devised by Knut Magnusson of Alberta, would use a greatly flooded Lesser Slave Lake as a reservoir. A different approach was that of T.W. Kierans, a Sudbury engineer who would dam the rivers flowing into James Bay and reverse them, lifting the water southward over the divide so that it would flow into the Great Lakes. Kierans suggested it would then be used for regulating the levels of the lakes, and for export to water-short areas of the United States. McGill University Geographer Dr. Trevor Lloyd referred to NAWAPA in terms that apply to all such plans when he said: "Clearly we have here an exercise in sophomore civil engineering which has received far greater attention than it ever deserved. It underlines the danger, all too familiar to geographers, of allowing the drawing office to replace acquaintance with the land and the people as they really are. It is sometimes the path of wisdom to prevent the large-scale rearranging of nature, especially when it is based on inadequate knowledge, and hasty and ill-conceived plans."

Such schemes are innocent of even the most rudimentary consideration of the natural functioning of rivers and lakes, or of the animal and plant life that depends upon them. Nor do they recognise the fact that the nation that is Canada is the result of, and depends upon, the existing relationship between land and water, a thesis that will be developed in Chapter 10. No economic consideration of any degree of sophistication has been allowed to intrude, and the social disruptions inherent in the plans are never considered. The plans rest upon the assumptions that additional water is required in large volumes in the United States, and that great surpluses of water exist in Canada. We have seen that these are both highly questionable and dubious propositions.

When the NAWAPA plan appeared, it was the subject of a great deal of discussion. It was taken very seriously by Canadian parliamentarians and American politicians. Senator Frank Moss of the State of Utah was its most outspoken champion, and as Chairman of the U.S. Senate Special Subcommittee on Western Water Development, he was consistent and effective in advancing the cause of massive water development. The prestigious American publication *Science* editorialized: "The present NAWAPA concept is grand and

imaginative. It is to be hoped that the Canadians will join us in this great project, but alternatives should be studied." As Dr. Frank Quinn of Canada's Department of the Environment has said, the import approach favours implementing in one massive sweep an ultimate solution to all foreseeable water problems. "One might well wonder whether a spirit of Manifest Destiny is not reborn [in the U.S.] in the continental use of Canadian waters."

But it soon became clear that Canada had nothing to gain and a nation to lose in the process of massive water export. General McNaughton led the opposition at first, engaging in the last great battle of his career which ended only with his death in 1966 at 79 years of age. In the succeeding years, the great cost of continental water schemes to Canada has become so obvious that few are actively promoting them in Canada. Even amongst dedicated water export enthusiasts it has become fashionable to deride NAWAPA particularly, and the great continental schemes generally. As Dr. Arleigh Laycock has said: "The proposal [NAWAPA] contains few advantages and many disadvantages for Canada, and the negative attitudes engendered have been widely applied to all export proposals." This is a matter for regret to Dr. Laycock, since as we have seen he has consistently promoted water export to the U.S. in a variety of ways.

Will NAWAPA or one of its cousins ever be built?

Roland P. Kelly is vice-president of the Ralph M. Parsons Company of Los Angeles, which designed NAWAPA. This personable engineer isn't at all downhearted about the criticism of the project. He is sure that NAWAPA, as a concept, will become a reality. It may not be called NAWAPA, and the dams and diversions may not be in precisely the locations suggested in the NAWAPA scheme, but he is convinced water movement in the spirit of NAWAPA will occur.

Why the optimism? Well, Mr. Kelly has been following with interest current water development projects on both sides of the border. "There are a number of construction projects now coming toward completion, namely Kettle Rapids in Manitoba, Mica Creek dam in British Columbia, which could become an integral part of it." So, without the overall plan, without any international treaties, and even though Canadians are a long way from any acceptance of the principal of water export, the Parsons company sees the pieces beginning to fall into place.

Fully to appreciate why things appear this way. it is necessary to review water development projects in existence, under construction, being planned or being studied in Canada from the west coast to Quebec. These include the Yukon-Taia project in the Yukon and British Columbia, the Bennett dam on the Peace River, the Columbia Treaty dams in B.C. and Montana, the Moran Dam on the Fraser and other water and power developments under discussion in that province, the PRIME program in Alberta, the Saskatchewan-Nelson Basin Study across the three prairie provinces and the completed Gardiner Dam on the South Saskatchewan River, and the Churchill-Nelson Hydro developments in Manitoba. Federal-provincial studies procede on northern Ontario Rivers flowing into James Bay to determine how the water could be used in their basins or diverted southward into Lake Superior, while five great rivers on the east side of James Bay are to be damned and diverted by the government of Quebec to generate power.

We will briefly examine what is involved in these plans and projects, then consider what their relationship might be to water export.

In Canada's North, the United States, Canada and British Columbia are together studying the Yukon-Taia project, which calls for five dams on the Yukon and Teslin Rivers. These would hold back the waters of the Yukon, Canada's fifth largest river, flooding several of the largest and most beautiful lakes of the North. Atlin Lake, Taku Lake, and Tagish Lake in British Columbia, along with Bennett Lake, Marsh Lake, and Lake Laberge, in the Yukon, all famed for their role in the Klondike Gold Rush, would be flooded. They would become little more than fluctuating reservoirs, and with them would die one of the greatest hopes for extensive tourism in the North.

The enormous quantities of power generated by Yukon-Taia would be expected to provide energy for mining and for the processing of ore. And a five hundred mile long high voltage transmission line would tie the plant into the west coast power system of which B.C. Hydro is a part. In recent years, however, it has become clear that the advantages once associated with the location of large power consumers such as aluminum smelters on tidewater near large hydro-electric power sources no longer exist. Resources economist Gunter Schramm has shown that it is more important for such industries to be closer to their markets, and that no more

Kitimats are likely. The large aluminum companies have indicated too that they are no longer interested in isolated locations just to acquire cheap power.

Yet water developments very seldom are related to any kind of realistic economic analysis. So the lack of economic justification for the Yukon-Taia project will certainly not be the deciding factor, particularly in a project with international implications. It would be quite in keeping with water development experience elsewhere for the proposal to acquire a life of its own, and to proceed even though the purpose for which the study was initiated no longer exists.

Many of Canada's largest water developments have been carried out in British Columbia. It is in this province that many of the nation's greatest rivers are to be found, and it is also in this province that development at any cost has been the governing credo. The "Two Rivers Policy" of B.C.'s former premier, W.A.C. Bennett, ended the free flow of two of the continent's greatest rivers, the Peace and the Columbia, with consequences of an economic, environmental, social and political nature that will be a lasting legacy. Bennett's government, through studies carried out by the B.C. Energy Board, was sorting out priorities as it considered the damming of most of the remaining rivers of the province when it was defeated August 30, 1972, by the New Democratic Party led by Premier Dave Barrett.

The damming of the Fraser River has been studied in detail, with engineers favouring a site at Moran Canyon, near Lillooet. Others being considered are the McGregory river, a northern tributary of the Fraser where great numbers of big spring salmon spawn; the Dean River, the greatest steelhead river on the coast; the Skeena, the Stikine and its tributary the Iskut; and the list goes on. All are very important salmon spawning-rivers. The NDP has long opposed Moran Dam, but its position with regard to all the other water development proposals in the B.C. Energy Board report is unknown as this book goes to press.

The Liard River is the largest tributary of the MacKenzie, which is itself second only to the Mississippi on the continent. British Columbia is studying several dam sites on the Liard for power generation, and presumably the federal government is doing the same on that section of the Liard flowing through the Yukon and Northwest Territories. Further south, in B.C., another flood control project proposed for the Fraser River system would place dams on the

Clearwater river within Wells Gray Park, flooding areas of great beauty with large wildlife and fish populations.

In Alberta, the PRIME program is a master plan for the use of the province's water. Its purpose is to divert to the south water presently flowing northward toward the Arctic ocean.

While no "need" has yet been specified, the first project of the PRIME scheme, the Big Horn Dam on the North Saskatchewan River, is underway and scheduled for completion in 1973. In addition to generating power, it will make possible the diversion of water from the North Saskatchewan River into the Red Deer River, for development of irrigation in east-central Alberta. Soil studies showed clearly that the soils of the area are not good for irrigation, and so the practicality of such a project is highly questionable. Yet the Big Horn proceeds and will create a lake 20 miles long, flooding the beautiful and historic Kootenay Plains area.

Big Horn is just the beginning of PRIME developments. Virtually all the magnificent free-flowing rivers spilling through mountain passes out onto the prairies would be manipulated in some way. The project which is receiving most attention at present is the Pembina Dam, about 60 miles west of Edmonton. It is of great significance. Diverting water out of the Pembina, a tributary of the Athabasca, into the North Saskatchewan River would be the first diversion of Arctic-flowing water into a more southerly stream. The implications of this will be explored in some depth later.

The PRIME plan has been officially shelved by the Conservative government which in 1971 defeated the Social Credit administration under whose authority the scheme had been developed. But it lives on as part of the federal-provincial Saskatchewan-Nelson Basin Study. This five million dollar study covering the three prairie provinces has as its objective, "a study of the water resources of the Saskatchewan-Nelson Basin, including the potential additional supply by diversion or storage. In carrying out the study, the Board will consider the engineering feasibility and cost of the many combinations of storage and-or diversion works needed to provide a firm water supply of varying ammounts and varying seasonal distributions, at various selected points along the river system."

The eighteen "selected points" chosen by study engineers are not explained in the reports of the Saskatchewan-Nelson Basin Board. Presumably an arbitrary figure has been selected

representing an amount of water that might be useful if at some time certain amounts of water were desired for irrigation or power developments or industrial expansion. Political sensitivities may be involved, but whatever the reasoning, there has been no public explanation of the need for these volumes of water at these points. Nor is there an explanation of the social goals of the prairie provinces that would require changing the entire water flow pattern of the region. There is no expressed recognition of the nature of the rivers as living systems whose manipulation will inevitably have enormous consequences upon the landscape of which they are a vital part. Yet studies continue on 54 dams and diversions, various combinations of which would convert the enormous Saskatchewan-Nelson basin into a gigantic plumbing system, the major purpose of which would be to move northward flowing water south.

Planners explain that the Saskatchewan-Nelson structures will be built only as required in a stage-by-stage, carefully-phased development. It is likely that this expresses correctly their intention, but experience in the United States where this sort of planning originates indicates that water development has a "stair-step" effect. One diversion has such great side effects, both predicted and unforeseen, that the only solution seems to be to divert water into the deprived river from still another watershed. As economist David Seckler of the University of California has put it with respect to the California experience: ". . . You go kind of in a domino fashion, stumbling further north, without end, really, and up to Canada probably."

One could expect such a sequence of events to occur if for example the Pembina dam were to be built as planned at Evansburg west of Edmonton, diverting water through the Sturgeon River into the North Saskatchewan. Inevitable damage to the Pembina basin downstream from the dam would require an infusion of water from the MacLeod River, which in turn would require as a technological bandaid water from the Athabasca River. Also, problems would have been building up downstream on the Athabasca, because both the Pembina and MacLeod are tributaries of it.

This sequence is all provided for in PRIME and in the Saskatchewan-Nelson study; what is not admitted is that the time over which the projects would be developed would likely be determined by the need to ameliorate the damage

from each preceding division, rather than by any expressed need for water.

The Nelson River drains the watersheds of the Saskatchewan River from the West, the Red and Assiniboine from the south, and the Winnipeg from the east, into Hudson Bay. All the water from these hundreds of thousands of square miles of Canada meet in Lake Winnipeg. In one magnificent stream the Nelson carries it all, more than fifty million acre feet of water, to the sea. On the way it drops about 700 feet, and Manitoba Hydro plans to wring from the river all the energy that fall represents by means of a string of hydro plants along its length. The first major dam at Kettle Rapids has been completed, and others are expected to follow in fairly rapid succession. To provide even more water to spin the generators in these plants, it is intended to dam the Churchill River, about one hundred miles further north, and divert its flow of some twenty million acre feet across country into the Nelson. The environmental and social implications of this rearrangement of major northern rivers are enormous, as we discussed in Chapter 4.

In 1965, the federal government and the government of Ontario agreed to study the possible diversion southward of waters normally flowing into James Bay and Hudson Bay. And so a Co-ordinating Committee on Northern Ontario Water Resources studies spent several years on studies "to determine present and future requirements for such waters, and to assess alternative possibilities for the utilization of such waters locally or elsewhere through diversions." Though federal officials have indicated the water would be used at the site, presumably for power, Ontario Hydro has indicated that it is not particularly interested in developing these northern rivers for hydro-electric power. Maps associated with the reports of the study committee show clearly that the studies provide for the movement of large volumes of water south to Lake Superior.

Federal officials state that any diversion into the Great Lakes would be for the purpose of stabilizing their levels. The Great Lakes cover an area of 95,000 square miles, and their vast storage capacity makes them one of the best naturally-regulated water systems in the world. But of course, some fluctuations are inevitable. When the water drops, as it did in 1964, navigation interests proclaim that something must be done about it. When it rises to higher than normal levels as it did in 1952, people with property

along the shore may be disturbed. Some suggest that control structures between the lakes might even out the fluctuations somewhat, but even this is extremely difficult because of the sheer size of the lakes. The very factor that under natural conditions maintains the lakes at such remarkably stable levels, makes it extremely difficult for man to control the lake levels according to his own wishes.

When consideration is given to diverting southward water that normally flows into James Bay to help stabilize the lakes, the problems encountered appear insoluble. As M.W. Thompson, engineering advisor to the International Joint Commission has pointed out, one cannot consider diversions either into or out of the Great Lakes unless rain and snowfall, and rates of evaporation can be predicted at least two or three years in advance. Otherwise, water added into Lake Superior at a time of low levels could be flooding lower lakes two or three years later when average or above average precipitation had brought those Lakes to normal levels. As an example of the delayed response in lower lakes to changes in water levels in upper lakes, three and a half years after a change in the water supply in Lake Huron has occurred, only 60 per cent of it will have yet been felt in the outflow from Lake Ontario. Diversion of Northern Ontario rivers in order to stablize the Great Lakes seems an untenable proposal.

In Quebec, an enormous hydro power development involving dams and diversions on five large rivers flowing into James Bay has been announced. As is normal in Canadian water development, little information is available about the plans, but estimates of cost range up to ten billion dollars, and about a quarter of the land mass of the province is in the watersheds to be affected. Six to seven thousand Indians will have their largely traditional way of life disrupted. Consequences of the project were discussed in Chapter 4. The decision was reached in private by Premier Bourassa of Quebec on the basis of two reports by consulting engineering firms which made no comments whatever on the possibility of environmental or social disruptions. The project is generally considered in Quebec to be a social, environmental, economic and political gamble of enormous proportions.

With this brief look at major water development programs across most of the nation, we can now come back to our original question. Will NAWAPA, or one of the other continental water diversion plans ever be built? Let's beg the question once more until we see what relationship the all-Canadian developments we've outlined might have to larger water export schemes.

The Yukon-Taia project in the Northwest would begin the reversal of flow of northern rivers that is the essence of NAWAPA or any other export plan. More dams further north in Alaska and the Yukon could add still more northern water to the southward flow. Dams built for power generation on such rivers as the Stikine and the Skeena would serve to keep the southward flow of water from moving out to the Pacific through the mountain passes, and would also generate power to spin the pumps that would have to lift the great new river upwards toward the 500 mile long reservoir in the Rocky Mountain Trench.

Power dams strung out along a river with the toe of one dam at the head of the reservoir of the next one, need only a simple change in machinery to reverse their function — with power fed into them, and the turbines reversed to serve as pumps instead of as generators, the flow of the river can be reversed. If Hydro dams are built at the sites being studied by B.C. Hydro on the Liard River, this great river which contributes 60 million acre feet to the MacKenzie each year could be reversed and made to flow down the Dease River and eventually into the Rocky Mountain Trench in accordance with a NAWAPA scheme. Or the water could be backed directly up the trench via the Kechika River valley as in the "Smith" plan. Smith would add to the reversed flow of the Liard by diverting MacKenzie River water into its own tributary, the Liard, at Fort Simpson.

Once in the Rocky Mountain Trench, the water would pass through the Williston Reservoir on the Peace River. The Bennett Dam has conveniently plugged the only opening to the east out of the trench. There are three breaks in the west wall of the trench further south; the Fraser, Columbia, and Kootenay Rivers. The Columbia will be sealed off by the Mica Dam, presently under construction, and the Kootenay River is now plugged by the Libby Dam in Montana which even now floods 40 miles back into Canada. That leaves only the Fraser, and the highly controversial Moran Dam near Lillooet would be the beginning of a solution to that problem. Fraser River development plans apparently require that another dam to be built upstream of Quesnel, and that will provide the final stopper in the walls of the Rocky Mountain Trench. With some channelling and pumping,

great volumes of Canadian water can then be moved to the United States.

The situation in the prairie provinces is even more clear. The PRIME program and the Saskatchewan-Nelson Basin Study are specifically designed to show how northern water can be moved south. If some of these projects are followed through, large volumes of water will be flowing near the international border, and it will take little more than a figurative "turning of the tap" to transfer water across the border, probably into the Missouri River system via the Milk River in Alberta, or via the Souris River in Saskatchewan or Manitoba. So it can be seen that the studies currently being carried out by the federal government and the prairie provinces will provide guidance for the construction of water projects that would fulfill most of the requirements of water export. Lake Diefenbaker, the reservoir behind the Gardiner Dam on the South Saskatchewan River, is the key to stabilizing flows throughout much of such a system, and it of course has already been built.

In northern Manitoba, completion of the Churchill-Nelson hydro scheme currently under construction by Manitoba Hydro will harness a flow of about 70 million acre feet toward Hudson Bay through a series of hydro plants stepped one above the other on the Nelson River. It would be quite possible to use the same structures to reverse the flow of the river, and draw the water off from the southern tip of Lake Winnipeg and Lake Manitoba for diversion to the United States through the Missouri River system or eastward to the Great Lakes. This would fit into such schemes as Dr. Roy Tinney's CeNAWAP, and others as well.

The sort of reasoning that might bring about such a shift in the use of hydro facilities on the Nelson River is provided by Professor E. Kuiper of the University of Manitoba. "One acre-foot of water, situated in Lake Winnipeg and descending through the eight projected power plants on the Nelson River with a total head of about 600 feet, would produce an amount of electric energy worth about one dollar. Therefore, if this same acre-foot could be exported at a $20 profit, we would naturally produce the required electrical energy by other means (coal or nuclear) and sell the water."

The federal-provincial studies in Northern Ontario clearly show ways of diverting water destined for James Bay and Hudson Bay southward into the Great Lakes. Water export enthusiasts on both sides of the border often suggest that this

would be the manner by which water export would first take place. Some of the proposals for making use of greater volumes of water in the Mississippi system and throughout the Great Lakes states were outlined in Chapter 2. Citizens in Northern Ontario have become greatly alarmed about such a possibility, because while government authorities continually try to be reassuring, studies continue that would make implementation of export plans possible in a relatively short time. Suspicions were heightened in January of 1970 when the Ontario government admitted involvement of the United States Army Corps of Engineers in studies of ice and water flow conditions in Northern Ontario. Ecological and archaeological studies are proceeding in areas that would be flooded if dams and diversions were to proceed as outlined in maps prepared by the federal-provincial Co-ordinating Committee on Northern Ontario Water Resources Studies.

The enormous James Bay Hydro project planned by the Government of Quebec is possible only because of the interest of American power interests in the electricity it would generate. But with respect to the export of water, the comments of Dr. J. A. Spence of McGill University, Montreal in April of 1972 are of interest. After describing some of the enormous ecological and social impacts that could be expected in the James Bay project area, Dr. Spence said: "I would like finally to raise one skeleton from the closet — if the original North American Water and Power Alliance [NAWAPA] plans proposed several years ago are recalled, it will be remembered that the eastern part of this fantastic scheme involved diversion of "excess" water flowing into James, Hudson and Ungava Bays to the south to dilute out the polluted rivers of the U.S.A. It was to start where the James Bay development is planned to end, at a proposed reservoir — the Kaniapiskau Reservoir in Central Ungava. The present proposals of the James Bay Development Corporation would be a useful start towards such a Water and Power Alliance, and towards ruining our northlands and throwing away our natural resources."

Back, finally, to our question. Will NAWAPA, or one of the similar schemes for the export of water to the United Sates ever be built?

It is extremely unlikely that any huge engineering scheme called NAWAPA or appearing to be similar to it will ever be initiated. After several years of often highly emotional discussion, no politician could sell to the Canadian people a

name that has come to mean "sell-out". Some Canadians see in the various water developments built, underway, proposed or under study evidence of a master plan that will only be admitted when it is well past the point of no return. But the number of people that would be involved in such a plan would be so large that keeping it under cover would be impossible. Not even cabinet ministers have much luck in keeping important secrets in Ottawa. So it seems unlikely that those opposed to continental water development will ever be confronted by a proposal that they can openly contend with. In fact, opposition to such programs will probably always be met by a political response that is in complete agreement with those opposing water export.

What is much more likely is that water development will proceed in Canada along the same lines as in the past, and in accordance with plans and studies currently under way. Much of the development will be for hydro-electric power, of which considerable amounts will be sold in the United States. This is the case in the James Bay program of Quebec, and also in the Nelson River program in Manitoba. It has been shown how a great many of Canada's hydro developments can be readily adapted to the export of large quantities of water, and that in fact they involve dams in almost precisely the locations called for in continental diversion schemes. Again, this is not necessarily because of some great overall plan, but because there are certain logical places on any river to put dams from an engineering viewpoint. It doesn't matter much what the reasons may be for putting the dams in place — the fact is that they will be correctly sited for water export, as well as for their stated purpose.

The situation with respect to actual diversion proposals is more straightforward. In the case of Northern Ontario, water would be moved into the Great Lakes from where it could readily be drawn off to the south. In fact, diverted water would probably have to be taken out of the lakes, because evidence is growing that any attempt to bring in water to control the level of the Great Lakes could be disastrous.

On the prairies, Alberta's PRIME program and the broader Saskatchewan-Nelson Basin Study have as their stated aim the movement of northern water to the southern regions of the country, or the investigation of such a possibility. This is of course precisely what is required for export, and in fact some Canadians, notably Dr. Arleigh Laycock, recommend that these projects be made larger than Canadian "needs"

would require so that water can be exported using these structures. He suggested there would be economies of scale realized, and American money would be available for construction.

Let us create a scenario, then, of what might happen as Canadian water development proceeds on its present course. Experience around the world and throughout North America shows clearly that the economic aspects of massive water development are always grossly miscalculated, with costs underestimated and benefits overstated. It is likely that continued water development will therefore mean a great increase in the enormous indebtedness already incurred for water development in Canada.

Then, of course, we will find as we become involved in these ever larger and more complex developments that the environmental impact of them will be enormous. This is certainly turning out to be the case with many single dam projects; the permutations and combinations of effects that whole systems of dams and diversion may have is almost totally unkown.

We are, then, moving toward a situation in which we will have great, uneconomic water developments across the country, creating ecological havoc of all kinds. They will have brought large volumes of water close to the border in all-Canadian projects, and most of the structures required to facilitate diverting still larger quantities south will have been built for hydro purposes. The temptation to recoup some of these enormous costs by turning the water across the border will be very great. The real cost of bringing the water down to the border would not be economic for the Americans, but of course they wouldn't have to pay it all since Canada would have already absorbed most of the costs in what were to be domestic projects. Canadian governments would probably be ready to negotiate what would be in effect stop-loss prices to get out from under the worst of the burden of debt, and to make up in a small way for the environmental destruction that would clearly be evident and irrevocable.

We could add a few more elements to the scenario. Suppose at last a breakthrough in technology makes fusion or solar power available in quantity, as can be expected within this century. Power would be available to run the turbines within hydro dams as pumps rather than as generators, thereby reversing whole rivers as described earlier. Other trends in Canada at present indicate that when the time for

such decisions arrives, even more of the Canadian economy will have become dominated by the multi-national corporations of the United States. We will be faced by the harsh reality that ever-greater continentalism has, in the words quoted earlier from historian Donald Creighton, "divorced Canadians from their history, crippled their creative capacity, and left them without the power to fashion a future for themselves." Such economic integration will enable the Americans to exert enormous political pressure on a Canada that will have gone very far in preparing the dams and diversions required for the export of water.

This sort of scenario, with perhaps more or fewer acts and perfomers, will likely lead Canadians into selling the only resource that they still largely control. It is a scenario which appears inevitable if present trends in Canada are followed. It shows too that Canadian politicians will, in all honesty, deny any intention of exporting water until just before it actually occurs. They will at that time be as appalled as the people of Canada at the lack of choice the nation has with respect to its water resources.

It is clear that the great danger lies not in the grandiose water export schemes such as NAWAPA that have been so thoroughly criticized in Canada. The real threat to Canada's water resources, and perhaps to the nation's existence, lies in the hydro-electric and water diversion projects within Canada that are at this moment under construction, or are being planned and studied.

Chapter 6

The economics of water development

The enormous cost of water development in social and environmental terms is becoming very clear. It would be reasonable to assume, then, that such projects must have overwhelming economic advantages. An examination of the economics of water development is the intended purpose of this chapter — but the reader with even a modest understanding of modern economic thought must expect to feel something like Alice in Wonderland as he tries to find logical economic procedures underlying many of our great water projects of both past and future.

One of the difficulties in dealing with such a subject is the scarcity of information about either completed or planned projects. It is uncommon for public assessment of any kind to be carried out after water projects have been completed. Gilbert F. White of the University of Colorado is one of the world's leading authorities in the field, and he has stated: "We could fill a large room with documents drawing up what are considered the best plans for and analyses of problems in river basins around the world. On the other hand, the literature about what has happened after any of the projects have been carried out can be assembled on one end of a small table. For example, no evaluation of the Tennessee Valley Authority has been undertaken. We have no satisfactory explanation of why, thirty years after the TVA was started in order to develop the economy of the region, the major part of the Tennessee Valley is still considered an underprivileged area of Appalachia, deserving special subsidy contributions from the federal government for further improvement." TVA has long been considered, of course, as a model of comprehensive river basin development.

Probably the only detailed economic analysis of major river development in Canada was that carried out by American economist John Krutilla on the economic implications of the Columbia River Treaty. Another study was carried out on major developments further downstream on the Columbia

Panamax – on The back shelf!

GREAT LAKES NEWS

Updates on "Action Agenda" restoration plans inside

Great Lakes United—an international coalition to protect and restore the Great Lakes / St. Lawrence River ecosystem

35-foot-deep trench through the lakes

U.S. floats destructive shipping expansion

by Jennifer Nalbone

The U.S. Army Corps of Engineers has released a draft study of replumbing the Great Lakes to allow access to much larger ocean-going commercial ships.

If fully constructed, the project could create a 35-foot (10.7-metre) trench across the basin, up from the current 25.5 feet / 8.3 metres. This would grant access to ships 1,000 feet long and 105 feet wide, up from the current maximum of 710 feet long, 76 feet wide.

The actual trenches dug would be deeper, because they need up to three feet of extra depth for safety. The trenches will also be wider, because channels often cannot be dredged straight down.

The overall "Great Lakes Navigation System Review" is in its preliminary stage, the current document being only a "reconnaissance" study in corps terminology, theoretically intended to determine if a more detailed "feasibility" study is needed. The feasibility study would take an estimated six to eight years to complete, cost a total of US$20 million, and require a US$10 million contribution by a "non-federal partner," that is, Canada.

"Options"

The reconnaissance explores only one general approach—physical expansion—to the 1999 congressional mandate for a study on improving the Great Lakes navigation system. The five options presented in the reconnaissance study simply amount to various versions of deeper and wider channels, locks, and ports.

Other kinds of options to adapt Great Lakes com-

continued page 35

A thousand-foot-long European Panamax-size ship, more than three football fields in length. End-to-end, just five of these ships are nearly a mile long.

EcoCity Cleveland, Cleveland Heights, OH
Environmental Law and Policy Center of the Midwest, Chicago, IL
Fisheries and Oceans, Ontario Region, Hamilton, ON
Friends of Red Hill Valley, Hamilton, ON
Friends of the Buffalo Niagara Rivers Inc., Buffalo, NY
Grand Valley State University Library, Allendale, MI
Lake Michigan Federation, Chicago, IL
Lake Superior Greens, Superior, WI
League of Women Voters, Euclid, OH
League of Women Voters of Cuyahoga County, South Euclid, OH
Niagara County Health Department, Lockport, NY
Northwatch, North Bay, ON
NYS Citizen's Environmental Coalition, Albion, NY
Ontario Ministry of Natural Resources, Lake Huron Management Unit, Owen Sound, ON
Quinte Watershed Cleanup Inc., Belleville, ON
Save Lake Superior Association, Beaver Bay, MN
Save the Oak Ridges Moraine Coalition (STORM), Aurora, ON
Save the River, Inc., Clayton, NY
Sierra Club—Northeast Regional Conservation Committee, Pittsburgh, PA
Tip of the Mitt Watershed Council, Petoskey, MI
UAW—Local 1102, Conservation Committee, Green Bay, WI
UAW—Local 2031, Adrian, MI
UAW—Local 55, Buffalo, NY
University of Waterloo—Environment and Resource Studies, Waterloo, ON
Wisconsin Audubon Council, Green Bay, WI

Six-year development plan

This is our second year of working on an ambitious growth plan for Great Lakes United. Last year proved to be a great beginning for us in our efforts to diversify our revenue streams and improve Great Lakes United's overall financial health and stability. To help us continue to reach our goals, we are launching two new campaigns that will run through the end of the year.

Coalition building

We have set a goal of securing seventy-seven additional organizational members by the end of the year. The campaign kicks of September 30. If you know of a group who could use the Great Lakes United coalition as a platform to speak about their own issues and the support of a bi-national environmental organization, urge them to check out our website at www.glu.org and join Great Lakes United. If you already are an organizational member, check your renewal date and make sure your membership is still current!

Great Lakes United can influence the actions of basin government and industry. But that influence comes only from the strength of our coalition—the more members we have, the greater our strength!

General support from citizens and family foundations

We need to raise US$18,000 (C$28,000) in addition to our usual revenues raised through renewals and appeals to fill funding gaps associated with our work on sustainable waters, habitat and biodiversity protection, clean production, and green energy. We are only able to continue these programs through public support and contributions from family foundations. If you are interested in making a tax-deductible donation of $1,000 or more to help offset the costs associated with this critically important work, if you are interested in setting up a matching gift, or if you know of a family foundation in the basin who might support this work, call Maureen Sileo at 716-886-0142.

The expertise that Great Lakes United brings together is becoming more and more in demand as we continue to push the concept of an "action agenda" for protecting and restoring the Great Lakes—St. Lawrence River ecosystem. As the only international organization working on these issues for the last twenty years, Great Lakes United needs your help to meet the challenges of tomorrow.

. . . *navigation trench*

continued from cover page

mercial navigation to modern economic and environmental realities—such as restricting entry by oceangoing ships and building transfer stations—were ignored by the corps study.

- Option 1 includes replacing the decaying St. Lawrence Seaway locks and the Welland Canal connecting Lake Ontario and Lake Erie at current dimensions and deepening connecting channels and ports throughout the Great Lakes to 30 feet deep. This option would allow movement of larger commercial lake vessels between Lakes Superior, Michigan, Huron and Erie and assure that they can carry more cargo than at present.
- Option 2 would perform the same modifications as option 1 but construct deeper (35 foot) channels and wider locks in the Welland Canal. This would allow larger commercial lake vessels from the upstream lakes access to Lake Ontario.

- Option 3 builds on option 2 and also replaces portions of the St. Lawrence Seaway with 35 foot channels and wider locks. The Detroit River would be dredged up to 35 feet. This option would allow larger ocean-going vessels access to Lakes Ontario and Erie and the city of Detroit.
- Option 4 builds on option 3 and also proposes extensive dredging and dramatic deepening of the entire St. Clair/ Detroit River system (the Detroit River, Lake St. Clair and the St. Clair River). This option would allow larger ocean-going vessels access to Lakes Huron and Michigan. Under this option the corps would construct "compensating works" to prevent deeper channels from causing increased draining of the upper lakes (Michigan, Huron, and Superior) and flooding of the lower lakes (Erie and Ontario). Such works were not built during the original opening of the St. Lawrence Seaway, resulting in an average reduction of nearly 15 inches (38 centimeters) in the level of Lakes Michigan and Huron.
- Option 5 builds upon option 4, deepening channels in the St. Mary's River and modifying the depth of the river's Soo locks. This option would allow larger ocean-going vessels access to Lake Superior, that is, the entirety of the Great Lakes system.

Concerns

For three decades, the Army Corps of Engineers has wasted tens of millions of dollars in studies and demonstration projects to prove that bigger locks, deeper channels and twelve-months-a-year shipping would make the Great Lakes America's "Fourth Coast." The economic justification for this claim has not withstood independent review.

Given the reduction in the region's manufacturing activity and its relatively flat population growth since the release of previous studies, there is reason to doubt the need for expansion. It is quite possible that the corps' asserted demand will never materialize.

Furthermore, after suffering large aggregate reductions in basin habitat and dramatically damaging invasions by exotic species, the Great Lakes ecosystem today is likely more sensitive to navigation-related ecological disruption than it was thirty years ago.

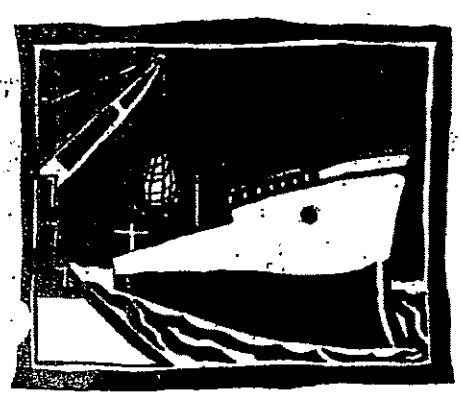
The economics

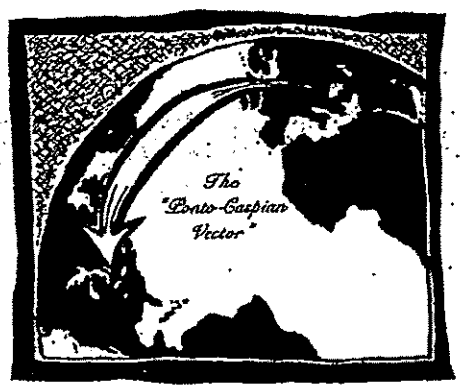
In recent years, the corps has been discovered to have manipulated economic projections to justify large-scale construction projects. But even highly publicized exposure of this practice has so far had little impact on corps proposals (for information on efforts to change this state of affairs, see "Greening the U.S. Army Corps of Engineers" elsewhere in this issue).

In what was briefly considered a U.S. national scandal of the first magnitude, a whistleblower documented fraud and the National Academy of Sciences criticized corps methodology for economic analysis of the Upper Mississippi navigation system.

Much of the projected economic benefits of Great Lakes navigation system expansion (up to US $1.4 billion per year) claimed in the corps' draft reconnaissance study were generated using the same methodology as that used in the Upper Mississippi navigation system review.

Meanwhile, the corps estimates that the cost to generate this gain would be US $10 billion to replace the fifteen locks in the Welland Canal and St. Lawrence Seaway, plus US $4 billion to $5.7 billion to deepen thirty-six U.S. basin ports. The report failed to include in the estimates increased maintenance costs for the larger system (particularly greatly increased dredging requirements), the cost of deepening Canadian ports, or the





Janelle 'bone

sizable expense required to build needed compensating works.

The draft review also does not bother to assess the cost of the expansion to ecosystem-dependent economies such as the sustenance, recreational and commercial fisheries, recreational and charter boating, municipalities and industries that use Great Lakes water, and communities reliant on summer tourism and cottaging, such as the Thousand Islands and Georgian Bay, much less to the noncommercial dimension of the ecosystem. The dollar value of goods and services that the Lakes provide, plus the value of economies directly and indirectly reliant on healthy Lakes have yet to be quantified.

Finally, Great Lakes commercial navigation has been steadily declining since the 1980s. There is no evidence that expansion proposed in the corps review will reverse that trend.

The environment

Oh, yes, the environment. The litany of environmental impacts associated with navigation expansion is nearlyl endless.

- Exotic species. More, larger ocean-going vessels entering the basin would increase the frequency and diversity of exotic species introduced into the Great Lakes and St. Lawrence River. The lakes, river and dependent economies have already been devastated by exotic species introductions. We need to stop the influx of exotics immediately, not facilitate more introductions.
- Deepening and widening. To accommodate larger oceangoing ships, the connecting channels, St. Lawrence River and dozens of harbors will need to be deepened as much as 9.5 feet (2.9 metres). In areas of soft bottom, the channels—including the St. Lawrence, Detroit, St. Clair and St. Mary's Rivers—will sometimes have to be widened significantly to stabilize the deeper ditch. In very biologically rich aquatic ecosystems like that of Lake St. Clair, which is so shallow in places that it borders on being a wetland, the potential for environmental destruction is dramatic.
- Blasting. According to two senior St. Lawrence River pilots, for the 1,000-foot (305-metre)-long, oceangoing ships to pass through the St. Lawrence River, islands bordering the current ship channel will have to be blasted.
- Dredging. Impacts of dredging hundreds of millions of cubic yards of river bottom include destruction of valuable fish habitat and re-suspension of contaminated sediments into the water column.
- Dredgeate disposal. The corps report itself states that dredging to allow a draft of 35 feet (10.7 metres) could generate hundreds of millions of cubic yards of material requiring placement. Disposing of this massive an amount of dredged material, much of it potentially contaminated with toxic substances, is unprecedented.
- Surge waves. Impacts of operating larger ships include larger surge waves that will increase shoreline erosion, property damage and water turbidity, reduce sunlight penetration, and degrade wetlands.
- Lower/higher levels. The corps could ultimately fail to construct compensating works. This would be politically controversial, but it happened during the last major expansion. Without compensating works the upper lakes will suffer significantly lower levels and the lower lakes will be at greater risk of flooding.
- Dead zones. Compensating works the corps chooses to construct could create areas of dead water that will suffer significantly altered water temperature and dissolved oxygen concentrations, two of the most important physical factors influencing all aspects of fish life stages.

The process

The Army Corps of Engineers will be releasing its final reconnaissance report by the end of September. It is all but certain that the report will recommend carrying out a full feasibility study. There is significant support in the U.S. for approving the funds needed for the feasibility study. The House Water and Energy Development appropriations bill contains $2 million for the study. The equivalent bill in the Senate contains $700,000 for the study. Canada, which must supply half of the study money, is not yet committed to the project.

U.S. domestic opposition

Great Lakes organizations are intent on stopping this outrageous project by opposing even a feasibility study. They are calling on the U.S. Congress to eliminate the funding for the corps' narrow study and instead support an independent review that would examine the eco-

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nomic justification and demand for expansion of this magnitude. The new review would also independently assess the full range of options for Great Lakes navigation and identify ways to operate commercial navigation that are compatible with efforts to protect and restore the Great Lakes.

Please voice your concerns to your members of Congress by calling 202-224-3121and asking for your senators and representative.

Canadian domestic opposition

Groups in Canada are petitioning Mark Fortin, director of seaway and domestic shipping policy at Transport Canada, to withhold Canadian funds from this study. The office of the minister of transport says that, "The federal government is currently assessing a number of strategies for future investment in the Seaway," including participation in the corps study.

Please take a moment to write Fortin and Transport Minister David Collenette. Let them know that the Great Lakes navigation system review is divisive, counter to international efforts to protect and restore the Great Lakes, and a plain waste of money. Send letters to Mr. Fortin at Transport Canada, Ottawa, Ontario, K1A 0N5, and to Minister Collenette at House of Commons, Parliament Bldg., Ottawa, Ontario, K1A 0A6.

An alternative study

Commercial navigation in the Great Lakes must become compatible with the freshwater ecosystem it operates within. If any study is going to be done on the Great Lakes navigation system, its terms of reference must be more comprehensive. It should examine the future of commercial navigation in the context of Great Lakes restoration. It should include conservation priorities and consider alternative ways of maintaining commercial navigation that minimize or eliminate environmental impacts to the system.

In a letter sent to the Army Corps of Engineers in April, Great Lakes United recommended study of:

- ☑ How to modify trade on the Great Lakes to reduce the overall impact of shipping trade on the Great Lakes- St. Lawrence River ecosystem
- ☑ The cost and benefit of establishing a fixed ballast water treatment facility to service both lake- and oceangoing ships operating in the Great Lakes and/or the St. Lawrence River
- ☑ The conventional economic impact of restricting oceangoing ships to a central transfer station in the lower reaches of the St. Lawrence River
- ☑ The environmental benefit of restricting oceangoing ships in this way

If you would like to review this letter, go to www.glu.org and click on "Prevent the Replumbing of the Great Lakes" in the "Very Hot" topics list.

To find the U.S. Army Corps of Engineers' draft reconnaissance study go to the Detroit District Web page at http://155.79.127.50/index.cfm?chn_id=1081. Click on "Great Lakes Nav Study" under the "Current Topics" heading.

The new SARA is far from perfect, for it does not offer mandatory habitat protection for the dozens of species outside of federal jurisdiction or for species that migrate across international boundaries (except for some birds and aquatic species). But now there is at least some hope for some of Canada's most imperiled wild species.

Based on an article in the Fall 2002 Nature Canada.

"Greening" the U.S. Army Corps of Engineers

by Tim Eder, National Wildlife Federation

The recent proposal by the U.S. Army Corps of Engineers to study a new plan to re-plumb the Great Lakes is another in a long line of troubling projects from a troubled agency. However, the corps is under tremendous pressure to change.

The corps' environmental track record

No other federal agency has had more impact on the nation's rivers, coasts, and floodplains than the U.S. Army Corps of Engineers. Since its formation in 1779, corps projects have included 8,500 miles of levees and seawalls, more than 500 dams, and 11,000 miles of inland waterway navigation channels.

Many corps projects to ditch, drain and replumb U.S. watersheds have dramatically altered the nation's most environmentally sensitive landscapes and the species that depend upon them. The impacts of water development affect 30 percent of the listed endangered species, ranking behind only agriculture and commercial development. Many corps projects and programs are directly involved in exacerbating these threats.

Pressure for change

A series of damning reports and investigations, from the National Academy of Sciences, groups like the National Wildlife Federation and Taxpayers for Common Sense, investigative journalists, the General Accounting Office and even the U.S. Army's own inspector general have faulted the corps for shoddy economic analyses, a bias in favor of large-scale projects, and ignoring environmental impacts. As a result, several bills have been introduced in the U.S. Congress to force the corps to change.

The National Wildlife Federation believes that there is an important role for the corps in our future. We need their help to restore past damage to aquatic ecosystems, some of it caused by the corps itself. The restoration of the Florida Everglades, damaged by corps water diversions and channels over the last fifty years, may cost nearly $8 billion. Smaller efforts—to remove dams, "soften" concrete-hardened shorelines, and protect watersheds—are already taking place in the Great Lakes region and elsewhere.

Corps Reform Network

This year, a nationwide movement of grassroots, regional and national organizations created the Corps Reform Network to advocate changes at the federal and local level. The fifty-member coalition is fighting on two fronts: pushing members of Congress to support corps reform legislation and battling several specific corps projects—like the Great Lakes proposal—that threaten local places all across the country. The challenge is to convince members of Congress to look past their own interests in bringing pork-barrel corps projects to their districts in favor of reforming the agency to help restore the environment.

The U.S. Army Corps of Engineers is at a crossroads, both here in the Great Lakes region and nationwide. One future path would have the corps dredging, ditching, diking, draining and damming remaining water resources through economically unjustifiable water projects.

The other path would have the corps working with conservation interests and state and federal agencies to protect and restore the Great Lakes and the water resources of the nation's other regions.

Taxpayers can't afford to invest in both. Citizens must urge Congress to insist on changes that put the corps on a path to a greener future.

For information on the Corps Reform Network, contact Tim Eder at eder@nwf.org.

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Just write or call us with their name and address. We'll send a free issue with no obligation.

Dredging Clinton's Ditch

A British-born engineer wants to dredge the Erie Canal to a larger size; he would use the dredge spoil to build industrial islands in the Atlantic Ocean near New York City. With the canal he would export coal and grain from the West, and on the islands he would site heavy industry. Among the questions: Who signs the permit to build? By Donald Sutherland

THEY'RE saying that if it were begun it could become the largest construction project in the history of the world. They're saying that if it were completed it would save the nation billions each year in the cost of energy, provide a home for hard-to-site industry, supply America its first modern deepwater port, loosen or break OPEC's grip on the United States, expedite egress of American coal and grain, solve problems of toxic waste disposal, cleanse the air and waterways of the Northeast, bolster the economy of the Atlantic seaboard and midwestern states for generations to come, and create four million man-years of jobs.

That's what they're saying for openers.

And as much as the proposed ICONN-Erie project sounds like science fiction in its sum, its parts are conceptually simple, even prosaic, and with abundant technical precedent. Yet its scope being as enormous as it is, the individuals and institutions that might administer it often become like the blind men investigating the elephant: each gropes about its respective section and pronounces that part definitive of the whole. Say the project's believers, you either understand the concept as a whole, or you don't.

The ICONN part of ICONN-Erie is the more provocative. It begins with a premise well known to all concerned with primary industry: Everybody needs and wants industry, but nobody wants it next door. This paradox supplies a major conundrum of the latter twentieth century, as citizens rightly clamor, on the one hand, about the unpleasantness and outright danger near population centers of petroleum refineries, power generating plants, liquid natural gas storage tanks, waste disposal, and similar resources swollen in environmental impact by the scope of the populations they are meant to serve. Yet those same citizens clamor equally rightly, on the other hand, about the price of fuel, of light, of heat, and of all commodities and products that depend on them.

Riddle: Where do you site heavy industry at a time when all suitable land is deemed inappropriate by reason of esthetics or health?

Proposed solution: Create new land.

ICONN is the acronym of Island Complex Offshore New York/New Jersey. Why not, says its originator, build some islands in the Atlantic? Upon them could be constructed the facilities for not only the uglies and the nasties of technosociety, but as well the resources that cannot exist elsewhere by reason of geology. Where in America, for example, do you find a harbor deep enough to accommodate the enormous supertankers in world trade? Nowhere. Result: They must offload to tankers small enough to fit. This raises both the cost of the oil and the risk of accident. So, says ICONN's originator, why not create the port facility where the water already is deep enough to accommodate a ship of sixty- or seventy-foot draft?

The project's originator is named Nigel Chattey. British-born, Chattey himself is much like the very project he proposes: more expansive than many observers can encompass. The abundant local news articles about him describe him variously as an "engineer" or a "geologist." Chattey declines to pigeonhole himself – in-

Donald Sutherland is a free-lance writer-photographer who publishes on a variety of subjects, operating out of Staten Island, N.Y.

deed, his gentlemanly bearing melds into something approaching wrath when he discusses the lack of cross-disciplinary education fostered by the schools, and exhibited by the institutions their graduates occupy – but in no recounting of his proficiencies does Chattey exclude his background as an economist. Then again, his resume shows credentials going back to the 1950's that make Chattey deeply experienced in the transport of bulk commodities. And, oh yes, the resume alludes frequently to experience in industrial siting.

For one with so much blue-chip in the employment record – Continental Grain, Maryland Shipbuilding & Drydock, California Texas Oil – and lofty affiliations – Explorers Club, Royal Geographic Society – Chattey, who finally formed his own consulting firm serving the Exxons and Arcos of the world, has promoted ICONN in a surprisingly simple, surprisingly grassroots manner. There have been no multimedia presentations, no hospitality suites and drinks on the house. Just an easel, a half-dozen flipcards, and Nigel Chattey. His audiences, some two hundred of them by now, have covered the gamut from urban planning commissions to university and environmental groups to congressional committees; anyone who might supply information, insight, and, most important, more bricks for his wall of influence and support.

"In 1971," he begins, "Mobil Oil retained Nigel Chattey Associates to locate the site on the Eastern Seaboard that would be suitable for their next generation of refinery. The survey lasted six months and ranged from the Florida Keys to Goose Bay, Labrador. Our conclusion was that there is no such suitable site anywhere on the land."

He makes a pause, his first of many, the brief silence becoming his exclamation point as the implications sink in: No place to put the refineries? Then as far as the Northeast is concerned, isn't all petroleum, even domestic petroleum, imported? Doesn't this raise its cost?

"What we also found, right here – " his knuckle raps the map on the easel beside him, in the portion representing a place ominously called Cholera Bank in the New York Bight about twenty miles off Long Island, "were two things. The first was a moving underwater black cloud of pollution so deadly it was killing even the starfish – " Deadly? Moving? "This is a dead sea here, where the city of New York dumps its garbage. And what else goes into the local waterways?" Chattey's first dizzying, numbing use of statistics is about to descend upon the minds and hearts of his listeners. "Ten million cubic yards of dredge spoil, four million cubic yards of sewage sludge, two million cubic yards of non-toxic acids, and one million cubic yards of miscellaneous debris *every year*." Another pause.

Poor starfish. Poor us. Not everything out there gets killed all at once. Some of it lives long enough for us to catch and eat it.

"The second thing we found here is an underwater terrain as flat as a billiard table. Under seventy feet of water is a potentially ideal construction site from a geological point of view."

And that is where Chattey's island complex would be built. Islands ranging in size, according to utilization, from maybe four square miles to maybe twenty, or about the size of Manhattan. Rather than being solid islands, they would be constructed as polders that are hollow down the middle with the surrounding walls holding back the sea. Similar structures have been built by the Dutch, whose Bos-Kalis-Westminster group has pronounced Chattey's concepts technically feasible.

The industrial facilities would be built, in effect, down in the hole of the doughnut. "This has several advantages," says Chattey, "including a low profile that would negate visual pollution of the ocean; you would not see ICONN from the shore of New York. In addition, this would reduce the wind pressure against the structures built on the island. This is a hostile marine environment out here – it is no place to be playing ducks and drakes."

There is another critical issue about sheltering the facilities within the polders. Suppose you had a refinery on one island, storage tanks for liquid natural gas on another. And suppose, in what is the most dreaded nightmare of holocaust, the tanks should decide to blow. The risk is considered real enough. Just ask the Boston harbor authorities, who require cessation of all other movements in the harbor while LNG-carrying ships move in or out: just ask any resident of Staten Island, New York, where legal action has kept empty – so far – LNG tanks that are among the largest in the world. The [illegible] of an LNG blast is popularly [illegible] with that of an atomic bomb, yet allegedly deadlier owing to the gaseous spread across the land- and waterscape, into tunnels, sewers, devastating the metropolis from within. Suppose such a blast happened at ICONN, with a refinery full of petroleum at the island next door?

"Coming from within the polder,"

Everybody needs and wants industry, but nobody wants it next door.

says Chattey, "the brunt of the blast would be directed skyward." The island itself and the surrounding sea could provide the protective cushion that shelters one facility from mishap at another.

And some of the islands could be built as wet polders that are filled with liquid. Seawater is one possibility, to further insulate tanks containing hazardous substances. Or, upon the liquid could be floating facilities, such as the floating power generating plants so widely discussed in many contexts. "Such a plant could be fully automated," says Chattey, "and would not care what it was floating in. It could be sewage."

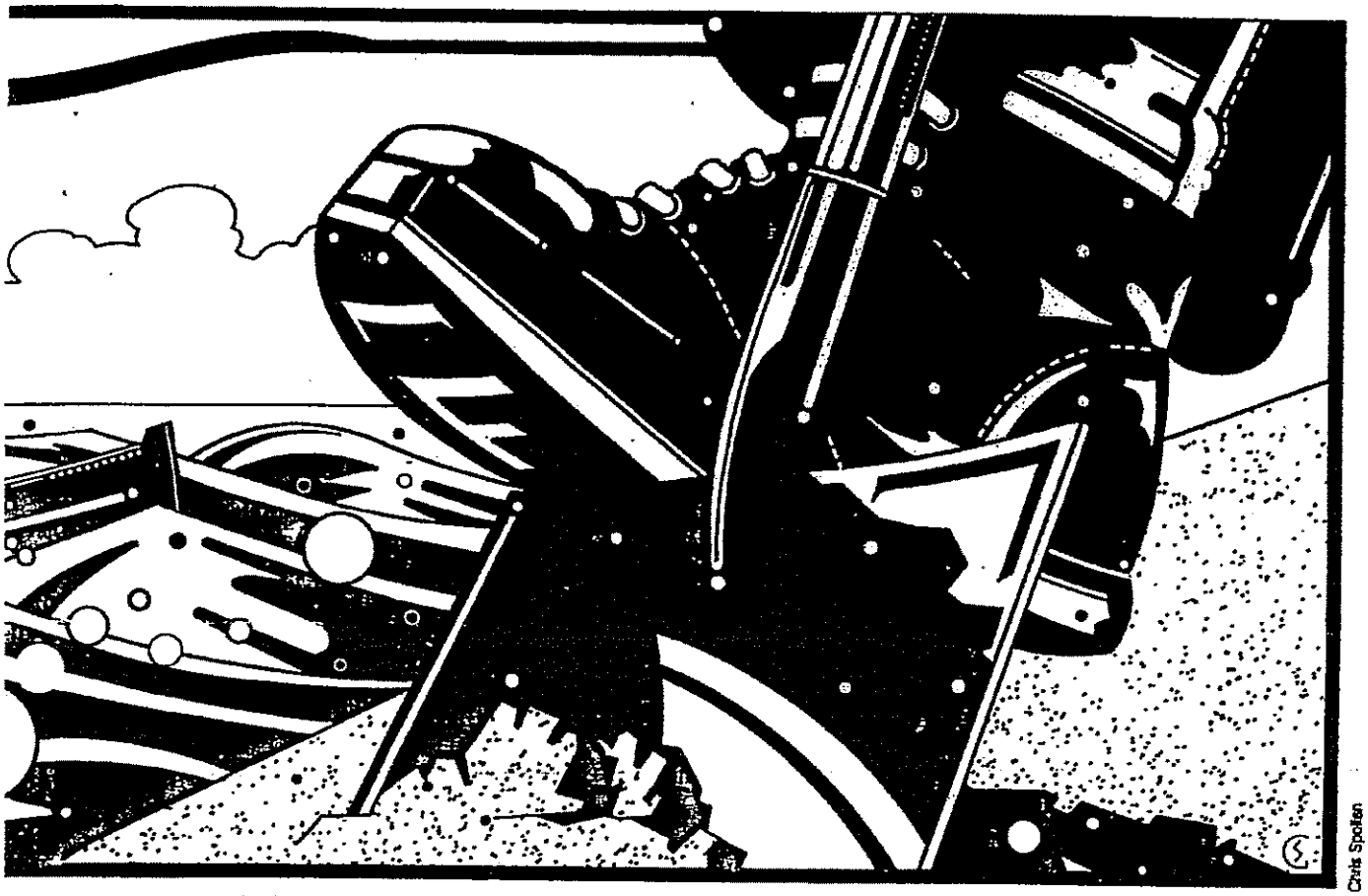
With major industrial facilities planned and programmed in terms of their interrelationships, instead of evolving haphazardly as in the past, ICONN's design could also exploit the fact that the wastes or by-products of many industries are the fuels or raw materials of many others. Vision, rather than happenstance, could dictate what resides next to what.

But it takes a lot of stuff to make an island, a lot more to make a complex of islands. For a pilot project, Chattey suggests that gravel from the ocean floor and stone from existing quarries in New Jersey might do the trick for, say, a four-square-mile island. But where do you get enough to build something more than seventy feet high and the size of Manhattan?

That is where the Erie part of ICONN-Erie comes in.

"At the beginning of the nineteenth century," continues Chattey, "the port of New York ranked behind Boston, Philadelphia, Charleston. Only one thing made it the premier port in America." His finger traces along the line between Buffalo and Albany, the line linking the Great Lakes to the Hudson River. "Clinton's Ditch—the Erie Canal."

Indeed, according to historian John A. Kouwenhoven, more than five hundred new commercial enterprises opened in New York City alone in 1825, the year the canal commenced operations. The towns along the canal also became thriving ports, and places like Syracuse, among others, were able to deliver their cast-iron goods all over the world. And in the Midwest, a Great Lakes whistle-stop like Chicago became, in effect, an Atlantic seaboard city. That influence reached down into the Southwest, whose herds of livestock could be driven to the windy city, slaughtered, and put on boats destined for anywhere along the Atlantic—either side.



Chris Spollen

But Chattey looked even further west, to Duluth and beyond. He studied Montana and Wyoming, where he found "the greatest reserves of coal BTUs in America." His appraisal of the situation is particularly striking for the energy-starved Northeast, most of whose coal comes from Appalachia. "Appalachian coal must be deep-mined," he says, "whereas western coal can be strip-mined. The productivity of Appalachian coal is 15 tons per man-shift and going down; of Western coal it's 150 tons per man-shift and going up." Another pause while those implications sink in.

The use of coal for electricity generation is difficult to dispute as an economic advantage. Along with nuclear, it constitutes a major controversy between the utilities and the public. Many of the utilities want to convert from oil wherever they can to lower costs. Assuredly the public wants the lower costs, but not the sulphur in the air, the acid rain in the waterways.

Entrapped in this social schizophrenia, officials are sometimes forced to make desperate-sounding statements. In New York City, for example, the Power Authority of the State of New York wants to build a coal-fired plant on Staten Island. PASNY Chairman John Dyson informed an outraged audience of the Chamber of Commerce they should not oppose the plant for two reasons: 1) PASNY would "buy" pollution that already befouls the city from New Jersey (this in compliance with environmental protection laws dictating that any newly constructed source of pollution must remove from the environment an amount of pollution equivalent to what it will contribute)—for a few million bucks each year, the net pollution would be the same; and 2) Staten Island should not resist the plant in the first place, because its 500-foot-tall stack would result in the effluents being blown to Manhattan and Brooklyn anyway.

If the trade-offs sound desperate, so does the situation that creates them. New York and all the Northeast are staggering under costs inflated by OPEC, and PASNY, for its part, wants to institute a ten-point plan for drastic reduction of oil imports. Part of this includes conversion of existing oil-fired plants to coal, and construction of other, new coal-fired plants like the disputed one on Staten Island. Yet while everyone welcomes the net savings, which PASNY projects at hundreds of millions yearly from one coal plant, the siting battle still pits gov-

ernment against government: The municipality, from Mayor Ed Koch down, resists the Staten Island plant, and local congressmen vow to make the issue a federal case.

HOWEVER, another part of the PASNY plan includes construction of a coal port in Buffalo to receive the Western product. Besides being cheaper, the Western coal has another advantage. It is low in sulphur. The PASNY plan specifies that the coal would be transshipped from Buffalo to downstate, and even to New England as required.

Yet a PASNY spokesman acknowledged that the method of transshipment is unknown. Existing rail lines were built for passenger service, and are inadequate for huge shipments of coal. And of course the Erie Canal, built to nineteenth-century specifications, is too narrow, too shallow for the enormous barges required to fuel the Northeast.

It was in 1975 that Chattey said Northwestern coal could come east. He said it could come through the Erie Canal – an enlarged, modernized canal. He said the fill dredged from the canal could be made into islands at ICONN. Even here, the waste of one part of the Erie project is the raw material of ICONN.

And Chattey envisions profound economies in the coal-bearing canal. "Studies have shown that water transport is the cheapest way to move coal and other bulk cargoes," he says. "One horsepower can haul 330 pounds by road, and 1,100 pounds by rail. But that same single horsepower can move 8,800 pounds by tug and barge." Again the skipped beat while the implications penetrate.

Then he reaffirms his clincher. "Fully 85 percent of the water route from Duluth to ICONN already is in place. The final 350-mile stretch, in the form of a sleepy nineteenth-century canal, is something for which the right-of-way already exists. And though Northwestern coal is the critical issue at the moment, it is by no means the only one that is relevant. Grain, like coal, is most cheaply shipped by water. By the turn of the century, our exports of grain to the world will have increased tremendously. Yet the Mississippi already is operating at capacity. To get the grain to that starving world out there..." again his finger traces along the map from Buffalo to Albany, down the Hudson, and out to ICONN and beyond.

And, of course, any goods that enter the country in bulk – ores, for example, or chemicals – similarly might find their way into the heartland by way of the economical expedient of water. Or maybe the refining would get done at ICONN. Or even the assembly into finished products.

And in the midst of all this bustling industrial and shipping activity, so the thinking goes, the North shall rise again.

A project of this magnitude raises serious questions, and Chattey acknowledges that ICONN-Erie done clumsily could constitute a monstrous disaster. "We are not saying the project should be built," he insists. "We are saying it should be studied. We believe that the urgency of our energy predicament, along with the demonstrated potentials for environmental improvement embodied in ICONN-Erie, fully justify a serious study of its feasibility." To make his study and answer as many questions as he can, Chattey is seeking $25 million.

The U.S. army corps of engineers has

ICONN: How Long, How Big, How Much?

VIEWED in its entirety – an enlarged Erie Canal and the construction of several large islands in the New York Bight – the ICONN-Erie project is one whose construction could be expected to continue easily into the next century. This timetable does nothing for the immediate energy shortage nor the upward spiral of present energy costs. However, Nigel Chattey advances several possible scenarios for the commencement of the project, including some that accommodate the pressing immediate circumstances.

"If the permitting process were made into a formality," says Chattey, "it would be possible to have an island constructed on Cholera Bank with, say, an electricity generating plant operating on it in from five to seven years of today."

This single island might be expected to measure in the range of two by two miles, which Chattey anticipates being about the smallest that would be cost-effective to build. This would leave plenty of room for compatible industrial facilities beside an electricity plant.

"The internal structure of the island could be made from the construction-grade sand and gravel dredged right there from the floor of Cholera Bank," including toxic substances already dumped by the city and rendered innocuous as construction materials, "and armored with stone from existing quarries in the Ramapo mountains of New Jersey."

Once built, such a single relatively small island could participate in the information-gathering process that determines the impact – and contributes to the permitting process – of additional islands. Though their dimensions probably would be different, the area of the biggest of these could be close to that of Manhattan. "The optimum size as well as the best configuration depend upon a number of factors, including the specific uses to which each island may be put, and these are some of the things we need to study," says Chattey.

One thing that is constant is Chattey's preference for an island design along the dike-and-polder concept. Here the island resembles a squared-off doughnut, with the industrial facilities constructed down inside the hole. This lowers the profile to protect the facility against winds and

Upon these islands could be constructed the facilities for the uglies and nasties of technosociety.

been engaged in its own study of enlargement of the Erie Canal. Major General James Johnson summarized progress for us as follows: "If we assume that the existing cross section of the canal now averages eighty feet wide by ten feet deep; and if we assume that everything we have to remove to enlarge it to the specified size is sand—easy to dig out, no blasting required—the price for the job in today's dollars will be $10 to $15 billion to enlarge the canal. That's a lot of money. And that's just to dig it out. I haven't said anything about putting the material somewhere, or raising bridges, or the construction of locks, the destruction of underground aquifers, the moving of buildings, of cities...."

The corps' cost-benefit ratio, the economic Rosetta stone by which one construction project is compared with another, will not, in General Johnson's expectation, be sympathetic to Chattey's notion of an enlarged Erie Canal.

The New York state department of transportation also has studied an enlargement of the canal, and the conclusion, known as the Creighton Study, similarly found that the cost of canal modernization would not be justified by the degree of increased traffic that would ensue.

And yet, as is the case with all statistical analyses, the outcome must be determined by the input, and therein lies a possible fly in the Creighton ointment. "The study evaluated the current situation of the Canal," said a DOT assistant commissioner for planning and development, "as well as alternatives to its improvement. But it did not look at the potential for attracting new and additional traffic that doesn't exist today, but that might result from the new economic developments of an enlarged canal. So I don't think anything fixed has come out of the studies that have been made so far."

General Johnson also acknowledged that by congressional mandate the corps of engineers is not permitted to examine many economic factors that are fundamental to the Chattey concept: the sale of American coal to Europe; the improved balance of payments to OPEC as coal replaces petroleum; the impact upon inflation of using low-cost coal; the impact upon unemployment and welfare rolls as a major construction project, often requiring no skills beyond the ability to move earth, replaces in the Northeast the jobs lured to the Sunbelt; even the possible reduction in costs, such as health care, that we now incur through a polluted environment.

What price for such things comes out of the national pocket? The interdisciplinary Chattey perhaps can find out. And when a comparative drop-in-the-bucket like PASNY's embattled Staten Island plant is anticipated "to save a net $1.4 billion between 1987 and 1991 on fuel alone, just by burning coal instead of petroleum," the scope of the figures begins to come into focus. And yet each agency that might evaluate the economic impact of the ICONN-Erie project is mandated to its own part of the elephant and nothing more. How can the department of transportation defend its assessment of ICONN's impact upon Welfare? The forms that must be filled out have specific boxes, specific lines, even though the paper they are printed upon was paid for from the general pocket.

So how are the figures generated, measured, computed?

Although the task is complex, Chattey is by no means alone in it. John Petty, formerly an assistant secretary of the

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storms, and it makes the structures invisible from distances beyond about fourteen miles away. And in the case of facilities that have an explosion risk, such as LNG storage tanks, protection would be afforded neighboring islands by the walls of the polder.

Both dry polders and wet polders can be considered, the former having their industrial facilities built upon a reclaimed ocean floor or upon fill—again possibly including toxic waste and slag taken from existing pollution control devices—whereas wet polders can contain liquid in their centers, with the industrial facilities floating within.

The decision of when or whether to enlarge the Erie Canal could be made during the meantime. "We have used the figure of a 250-foot width and 29-foot depth for the sake of discussion," says Chattey, "but we are not saying that is what it should be. A 14-foot depth could supply a thoroughly modern canal, and in fact sections of the Erie already are that deep. Maybe the optimum is simply to conform the entire canal to that depth. That's another of the things we have to study."

And when the study is completed, the bottom line everyone will look at most anxiously is the net cost of ICONN-Erie. For one would think the cost per kilowatt-hour of electricity is higher when it is generated from land that must be built than from land that already exists.

"We cannot say what the cost of constructing the polders would be," says Chattey, "and although we could extrapolate some figures based upon the experience of the Dutch, we have not, without sufficient funding, had the opportunity to do so."

But the cost of not having industrial siting may be measurable by the monies spent on other plans, some in the cards for us and others already frustrated. For example, the LNG storage tanks in Rossville, Staten Island, which [illegible] received a yard of gas because of adverse rulings on their safety so close to the population, were erected at a cost of $100 [illegible] million. And Chattey is fond of citing how New Jersey's Public Service Electric and Gas spent $350 million on floating nuclear plants before the plan was scrapped.

—D.S.

Will a group of islands plopped into the Atlantic change the currents and cause Long Island to wash away?

U.S. Treasury and now president of the Buffalo-based Marine Midland Bank, has been an ICONN-Erie believer since the beginning. "Chattey and I used to discuss global matters when we were students," he told us, "and his was the first forecast I ever heard that petroleum would become a political weapon. In fact, Chattey was the first I ever heard use the term 'petroleum dollar'! That was in the 1950's."

High-powered capitalists might be expected to endorse a project with such substantial industrialist leanings, but support also seems to come from those with more of a scientific inclination. "The Macro-Engineering Research Group would be delighted to remain in touch with this proposal for restoring the viability of the Northeast," wrote Dr. Frank P. Davidson of the MIT school of engineering. "We agree that the implications for Europe and for the international trade position of the western world are enormous and promising."

Wrote New Jersey's Governor Byrne, "I hope that the Federal Government... will carefully consider this project as part of the national and regional energy strategy," while New York's Governor Carey described ICONN-Erie as "a very worthy project" and added, "what has been referred to as a wild idea has suddenly become well worthy of study." New York City's Mayor Koch wrote, "to assure you... of my interest in the project and my belief that there should be further studies."

Chattey further reports that the New York State AFL-CIO, at its annual convention during the summer of 1980, passed a resolution supporting the ICONN-Erie concepts and agreeing to lobby in their behalf. Meantime, in areas of the state contiguous with the canal, enthusiasm for the project is being fanned by recently-formed regional development councils.

And on the editorial page of the New York *Times* for January 9, 1980, appeared these remarks: "This grand proposal, attacking at once the high cost of... fuel and the difficulty of siting unwelcome industries, is so complex that it will cost millions even to study it. But De Witt Clinton's plan to build the Erie Canal was equally dynamic. At a time when too many of us think of contraction and reduction and of the joys of becoming poorer, it is heartening that some neighbors dare to think big."

Other publications, struck with the inventiveness, the grandness, the science-fictionness, even the *obviousness* of the project once it is pointed out, are printing articles on ICONN-Erie and on Nigel Chattey as the brilliant visionary who finally identified The Problem and conjured The Answer. After five years of pushing, Nigel Chattey is about to see his concepts go where they must, if they are to go at all: into the national consciousness, as part of the American national discussion.

AND as they do, the controversies will emerge. Even now, a discussion with a spokesman at the Department of Transportation in Washington revealed that "somebody raised the point that those islands might be a hazard to navigation," even though Chattey insists they would be between the shipping lanes. Said an official of the Port Authority of New York and New Jersey, "I'd sure hate to see the rail lines that parallel the canal get obsoleted." And indeed, though the completed project might benefit the states of the Northeast and Northwest, and even neighboring states further south, somebody, somewhere, is going to envision in ICONN-Erie a loss of business for himself.

Even beyond vested interests are the legitimate environmental questions. Would so large a swath cut across New York state bleed upstate water resources into the Hudson? Are water resources in the Northwest sufficient to support the proposed degree of mining? Will a group of islands plopped into the Atlantic change the currents and cause Long Island to wash away? Do the winds at the ICONN site really blow out to sea 85 percent of the time as Chattey believes, and will the Gulf Stream really be able to neutralize such emissions as may escape from the island complex?

And if we put industry out of sight upon islands unto themselves, won't we also put the consequences out of mind? Isn't that what we did last time around, and can we afford to pay a second piper? Even if Nigel Chattey is the most honorable and most conscientious man in the world, can anyone guarantee the same of his successor?

But such issues as these merely pit man against the forces of nature. Perhaps more difficult to divine, given the realities of a bureaucratic world, is this: With a project that extends from the Great Lakes to twenty miles into the Atlantic, with implications in energy, in transportation, in engineering, in environment, and in realms assigned to a thousand other agencies and institutions, just who issues the permit to build?

But if an agency can be found or assembled to study something so massive; if another can be formed to administer it; if the overall benefits can be measured and demonstrated to outweigh the costs, and if the necessary political coalitions can persuade the nation that ICONN-Erie should be built, then one day the name of Nigel Chattey may join the roster of immortal builders. Yet even here Chattey will be distinguished. When we recall the earlier great builders – Clinton for his Canal, Roebling for his Brooklyn Bridge, even Cheops for his pyramid – we think of the charm or beauty or awe of their constructions. Chattey's monument would be to the smelly and the lethal, and to the fact that we very nearly ran out of time. Such is the world our builders now have to work with, and we to live with.

Suggested Reading

DONALD E. CARR, Energy and the Earth Machine, *W.W. Norton, 1976. Discusses various alternate energy sources and also describes how we have gotten to our current energy predicament.*

A63-GVA

WAR DEPARTMENT
CORPS OF ENGINEERS

BULLETIN No. 47

SURVEY OF NORTHERN AND NORTHWESTERN LAKES

APRIL 1938

BEARINGS ARE TRUE AND DISTANCES ARE EXPRESSED IN STATUTE MILES

This Bulletin is a complete revision compiled from former Bulletins; from surveys made by the U. S. Lake Survey (Col. C. R. Pettis, Corps of Engineers, U. S. Army, in charge); from annual and special reports of the officers of the Corps of Engineers, U. S. Army; from publications of the U. S. Bureau of Lighthouses; from information supplied by the Canadian Departments of Transport, of Public Works, and of Mines and Resources; and from revisionary data related to the river and harbor improvements carried on by the U. S. Engineer Offices on these waters, in charge of the following officers of the Corps of Engineers, U. S. Army: Lt. Col. E. H. Marks, Buffalo, N. Y.; Col. V. L. Peterson, Detroit, Mich.; Capt. S. N. Karrick, Chicago, Ill.; Lt. Col. W. H. Holcombe, Milwaukee, Wis.; Maj. A. B. Jones, Duluth, Minn.; and Col. D. McCoach, Jr., New York, N. Y.

The text has been edited and its publication supervised by Mr. O. C. Hattery, U. S. Lake Survey Office.

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THE GREAT LAKES, THEIR HARBORS, CHANNELS, AND NAVIGABLE TRIBUTARIES

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