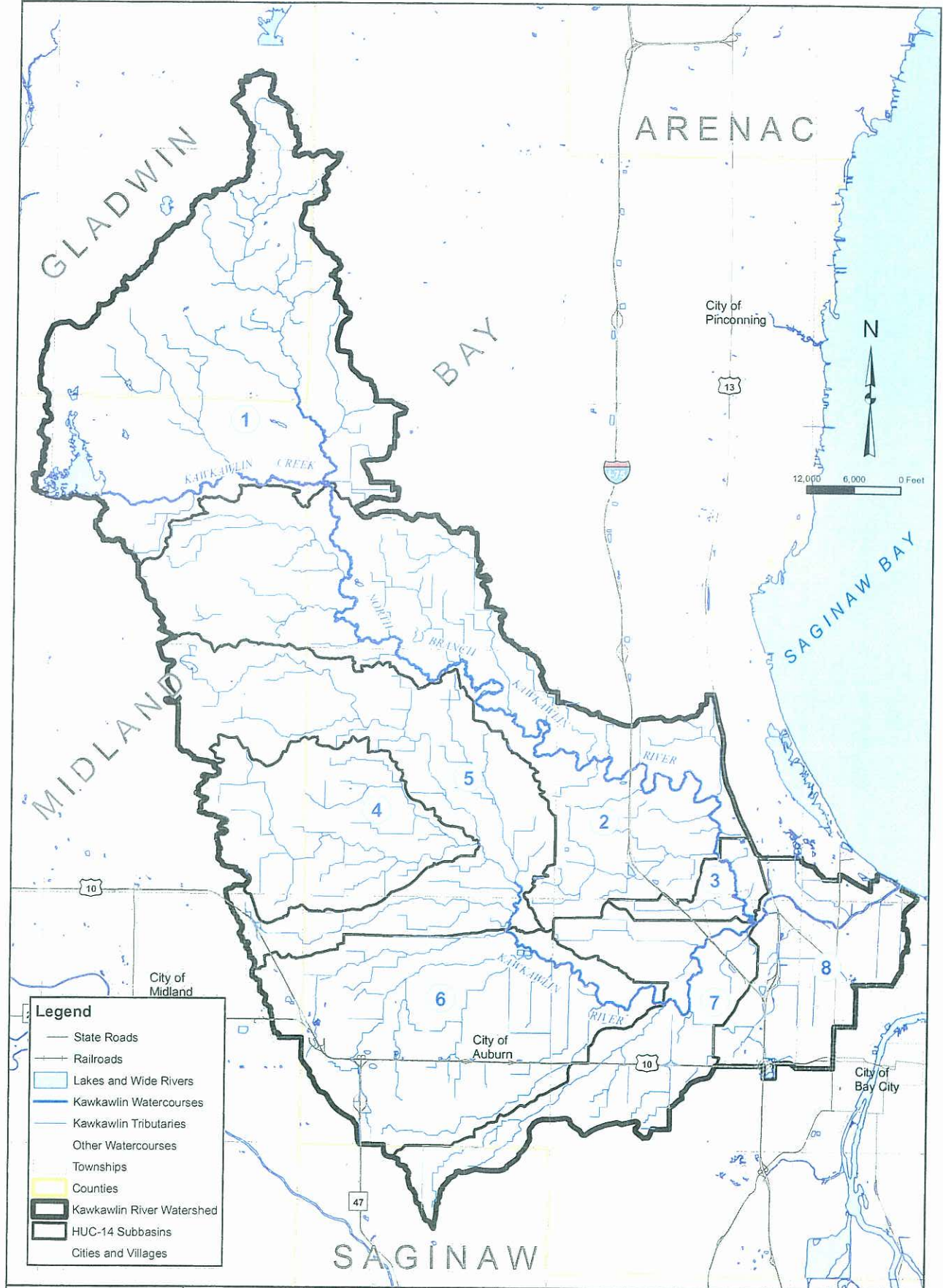


# Appendix A



- Legend**
- State Roads
  - Railroads
  - Lakes and Wide Rivers
  - Kawkawlin Watercourses
  - Kawkawlin Tributaries
  - Other Watercourses
  - Townships
  - Counties
  - ▭ Kawkawlin River Watershed
  - ▭ HUC-14 Subbasins
  - Cities and Villages



JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER  
 EXHIBIT 1  
 WATERSHED BOUNDARIES

KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

DATE: AUGUST, 2009

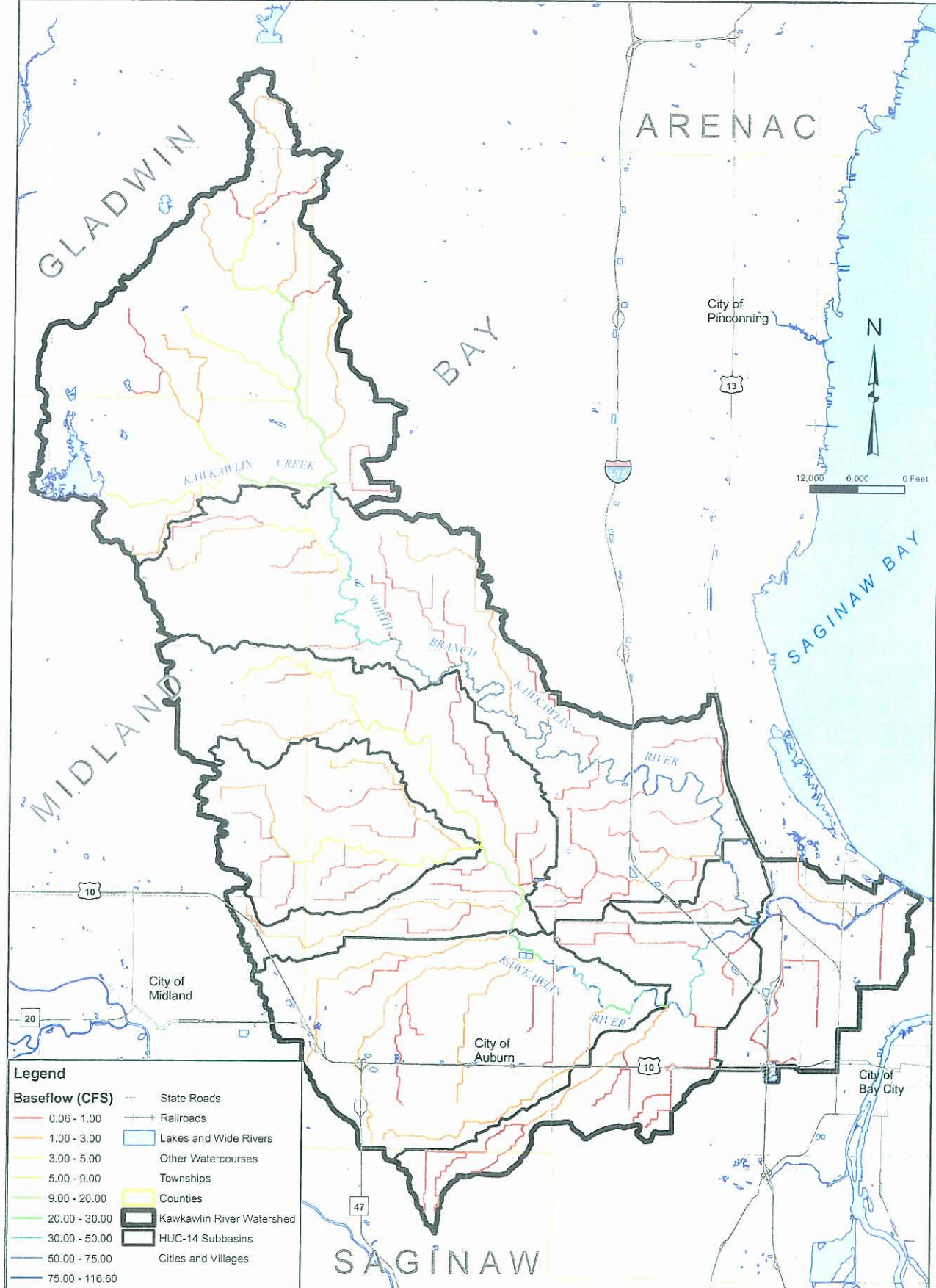
OFFICE LOCATIONS  
 SAGINAW, MI  
 ST. JOHNS, MI  
 CARO, MI  
 DETROIT, MI  
 TEMPE, AZ

DR. BY: MMC CHK. BY: RAB  
 DE. BY: MMC APP. BY: RAB  
 FILE NO. F-1090-01



PROJECT NO.  
 117345SG2008  
 SHEET 1 OF 1

SAGINAW OFFICE  
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 FAX 989-754-4440  
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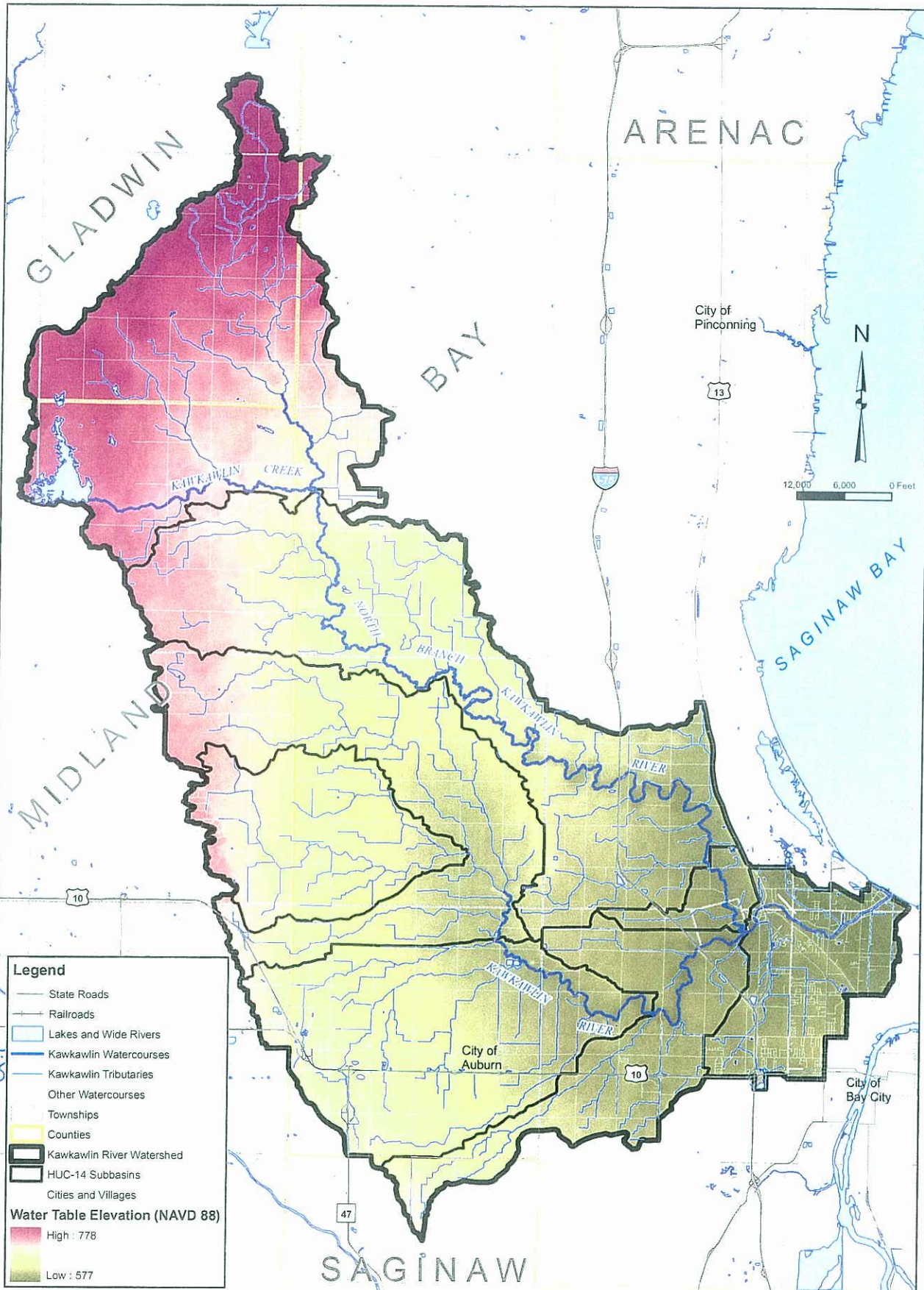
**Legend**

**Baseflow (CFS)**

- 0.06 - 1.00
- 1.00 - 3.00
- 3.00 - 5.00
- 5.00 - 9.00
- 9.00 - 20.00
- 20.00 - 30.00
- 30.00 - 50.00
- 50.00 - 75.00
- 75.00 - 116.60

- State Roads
- Railroads
- Lakes and Wide Rivers
- Other Watercourses
- Townships
- Counties
- Kawkawlin River Watershed
- HUC-14 Subbasins
- Cities and Villages

	JOSEPH RIVET BAY COUNTY DRAIN COMMISSIONER	DR. BY: MMC	CHK. BY: RAB	PROJECT NO.
	<b>EXHIBIT 2</b> <b>USGS BASE FLOW</b>	DE. BY: MMC	APP. BY: RAB	117345SG2008
KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES MICHIGAN		DATE: AUGUST, 2009	FILE NO.	F-1090-02
		OFFICE LOCATIONS SAGINAW, MI ST. JOHNS, MI CARO, MI DETROIT, MI TEMPE, AZ		
				SAGINAW OFFICE 230 S. WASHINGTON AVE. SAGINAW, MI 48605 TEL: 989-754-4717 FAX 989-754-4440 www.SpicerGroup.com
				SHEET 1 OF 1



**Legend**

- State Roads
- Railroads
- ▭ Lakes and Wide Rivers
- ▭ Kawkawlin Watercourses
- ▭ Kawkawlin Tributaries
- ▭ Other Watercourses
- ▭ Townships
- ▭ Counties
- ▭ Kawkawlin River Watershed
- ▭ HUC-14 Subbasins
- ▭ Cities and Villages

**Water Table Elevation (NAVD 88)**

- High : 778
- Low : 577

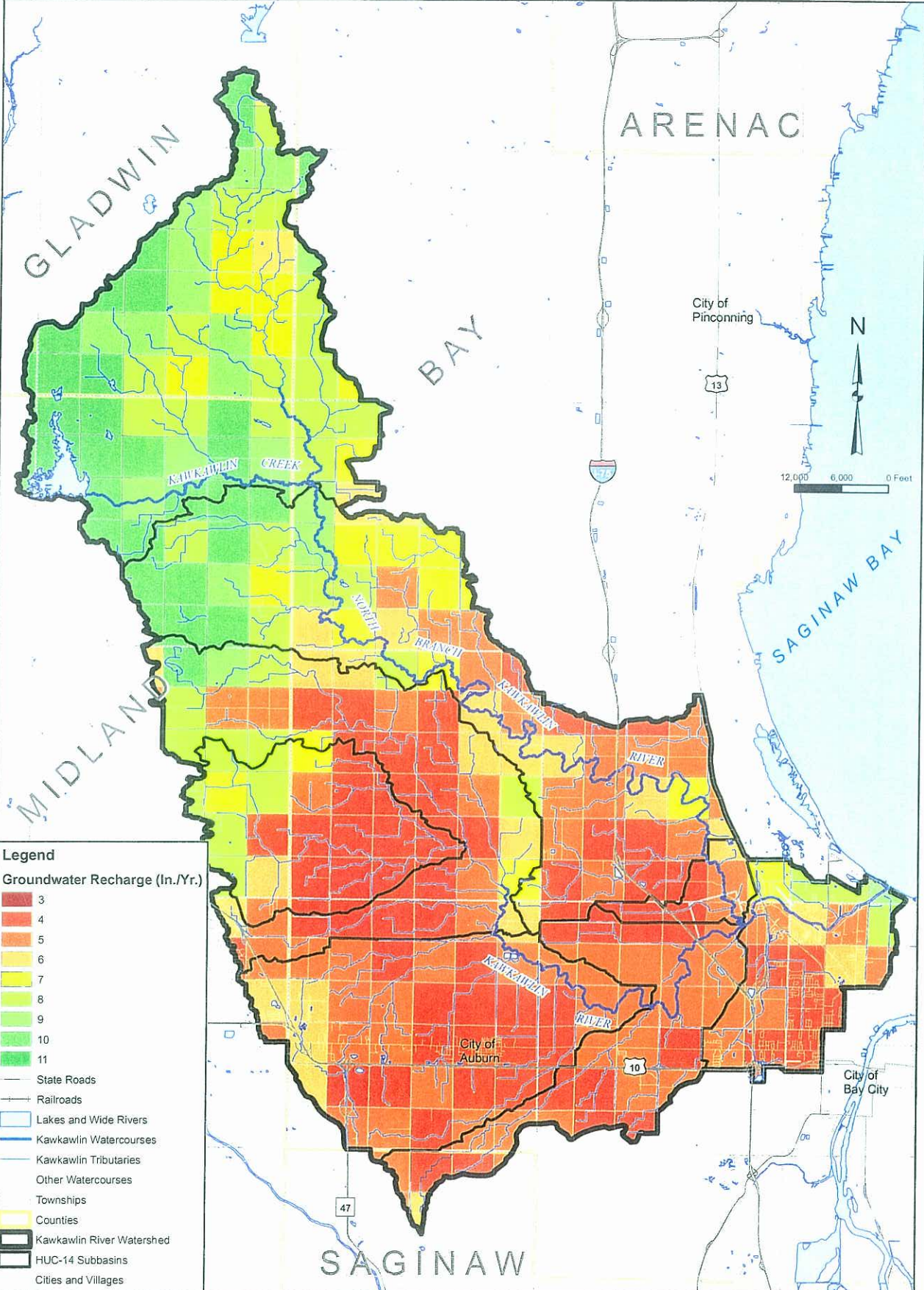


JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER

EXHIBIT 3  
 GROUNDWATER ELEVATION

KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

DR. BY: MMC	CHK. BY: RAB	PROJECT NO.
DE. BY: MMC	APP. BY: RAB	117345SG2008
DATE: AUGUST, 2009	FILE NO.	SHEET 1 OF 1
	F-1090-03	
OFFICE LOCATIONS SAGINAW, MI ST. JOHNS, MI CARO, MI DETROIT, MI TEMPE, AZ		SPICER GROUP SAGINAW OFFICE 230 S. WASHINGTON AVE. SAGINAW, MI 48605 TEL 989-754-4717 FAX 989-754-4440 www.SpicerGroup.com





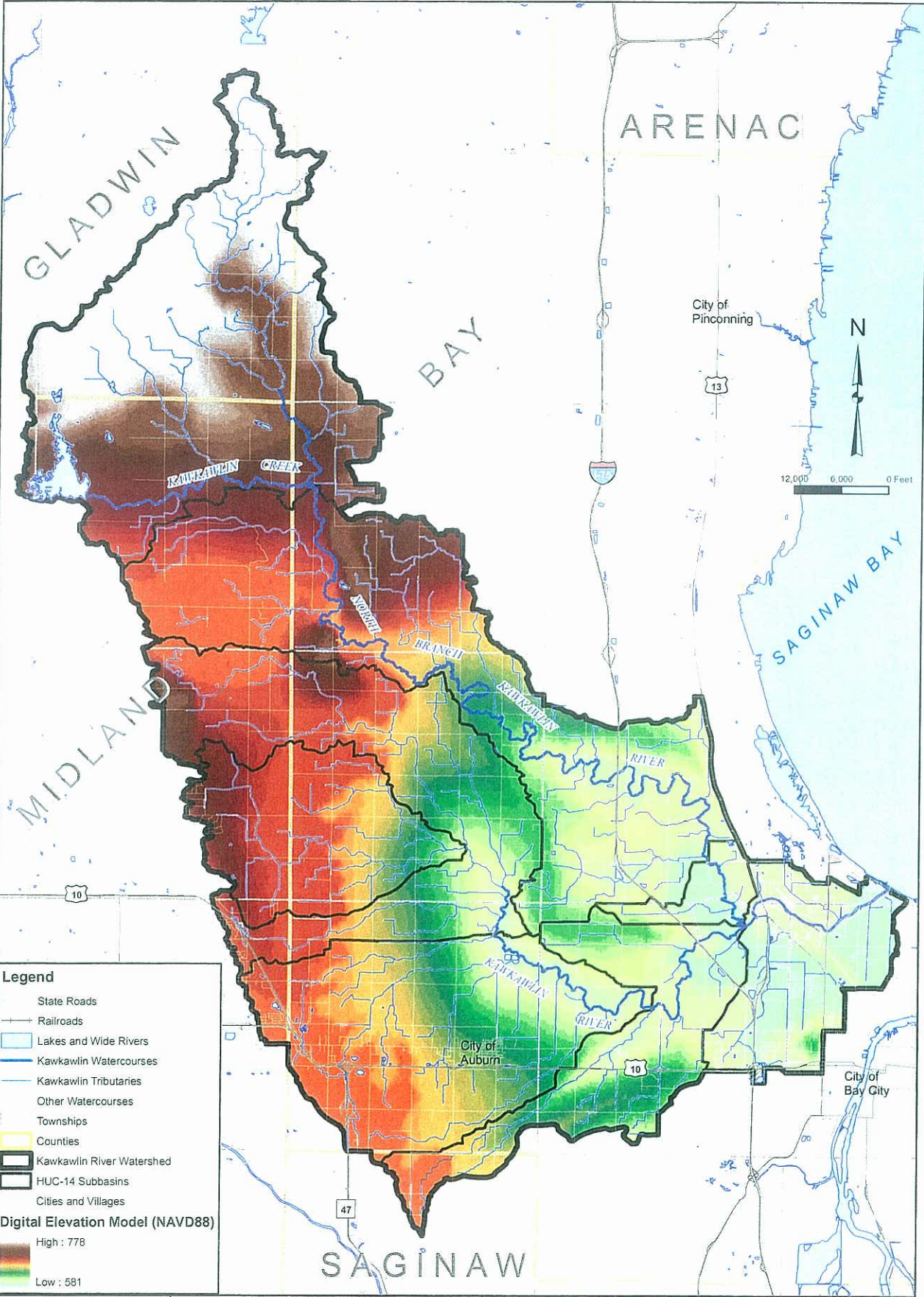
**Legend**

**Groundwater Recharge (In./Yr.)**

- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11

- State Roads
- Railroads
- Lakes and Wide Rivers
- Kawkawlin Watercourses
- Kawkawlin Tributaries
- Other Watercourses
- Townships
- Counties
- Kawkawlin River Watershed
- HUC-14 Subbasins
- Cities and Villages

	JOSEPH RIVET BAY COUNTY DRAIN COMMISSIONER	DR. BY: MMC    CHK. BY: RAB DE. BY: MMC    APP. BY: RAB	PROJECT NO. 117345SG2008
	<b>EXHIBIT 4</b> <b>GROUNDWATER RECHARGE</b>	DATE: AUGUST, 2009    FILE NO. <b>F-1090-04</b>	SHEET 1 OF 1
KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES MICHIGAN			
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**Legend**

- State Roads
- Railroads
- Lakes and Wide Rivers
- Kawkawlin Watercourses
- Kawkawlin Tributaries
- Other Watercourses
- Townships
- Counties
- Kawkawlin River Watershed
- HUC-14 Subbasins
- Cities and Villages

**Digital Elevation Model (NAVD88)**

High : 778

Low : 581



JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER

EXHIBIT 5  
 TOPOGRAPHY

KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

DR. BY: MMC	CHK. BY: RAB	PROJECT NO.
DE. BY: MMC	APP. BY: RAB	117345SG2008
DATE: AUGUST, 2009	FILE NO.	F-1090-05
		SHEET 1 OF 1

OFFICE LOCATIONS  
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 CARO, MI  
 DETROIT, MI  
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**Legend**

- State Roads
- Railroads
- Lakes and Wide Rivers
- Kawkawlin Watercourses
- Kawkawlin Tributaries
- Other Watercourses
- Townships
- Counties
- Kawkawlin River Watershed
- HUC-14 Subbasins
- Cities and Villages
- 1987 Bedrock Geology**
- SAGINAW FORMATION
- RED BEDS



JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER

EXHIBIT 6  
 BEDROCK GEOLOGY

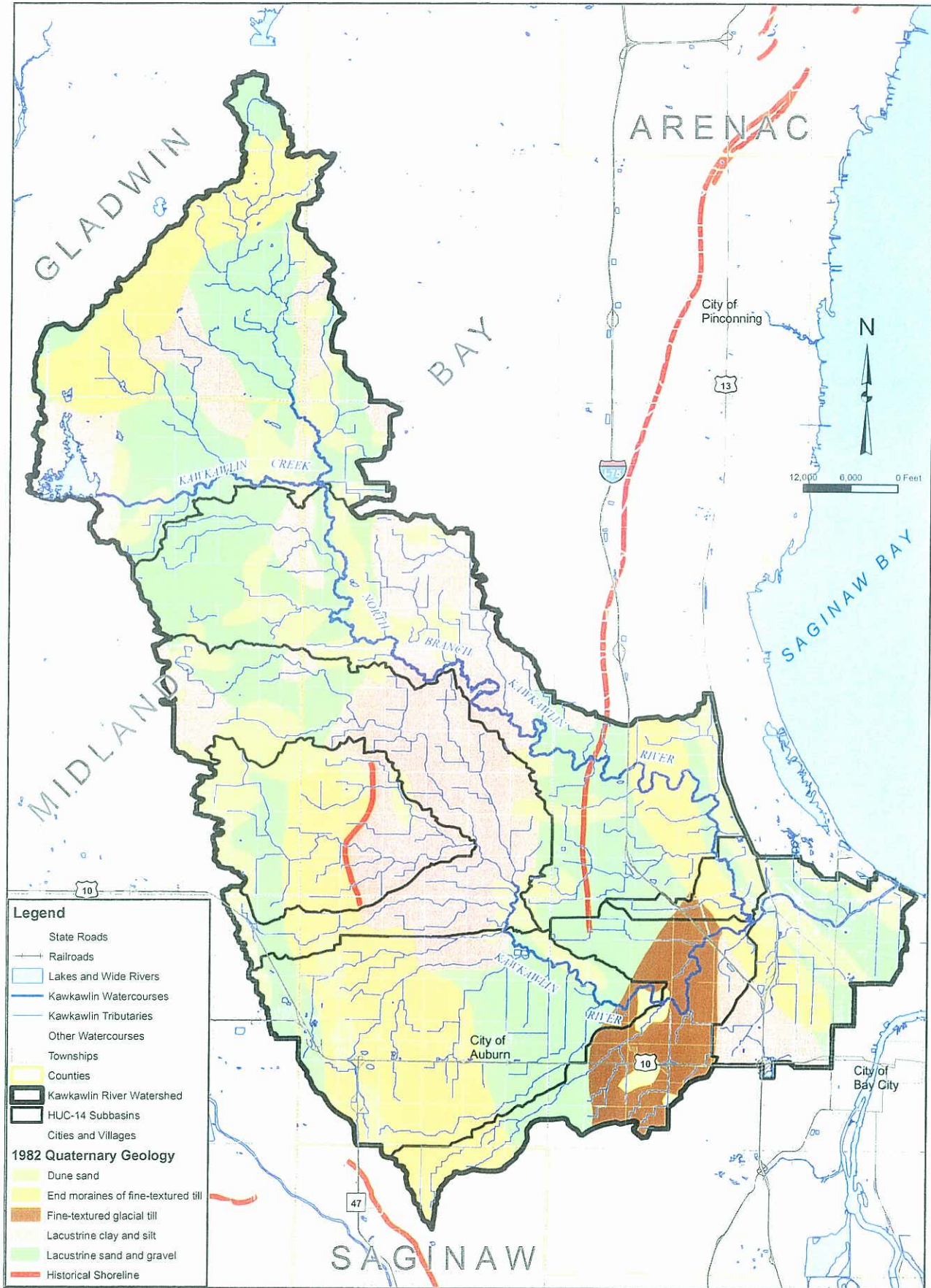
KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

DR. BY: MMC	CHK. BY: RAB	PROJECT NO.
DE. BY: MMC	APP. BY: RAB	117345SG2008
DATE: AUGUST, 2009	FILE NO.	F-1090-06
		SHEET 1 OF 1

OFFICE LOCATIONS  
 SAGINAW, MI  
 ST. JOHNS, MI  
 CARO, MI  
 DETROIT, MI  
 TEMPE, AZ

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**Legend**

- State Roads
- Railroads
- Lakes and Wide Rivers
- Kawkawlin Watercourses
- Kawkawlin Tributaries
- Other Watercourses
- Townships
- Counties
- Kawkawlin River Watershed
- HUC-14 Subbasins
- Cities and Villages

**1982 Quaternary Geology**

- Dune sand
- End moraines of fine-textured till
- Fine-textured glacial till
- Lacustrine clay and silt
- Lacustrine sand and gravel
- Historical Shoreline



JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER

EXHIBIT 7  
 1982 QUATERNARY GEOLOGY

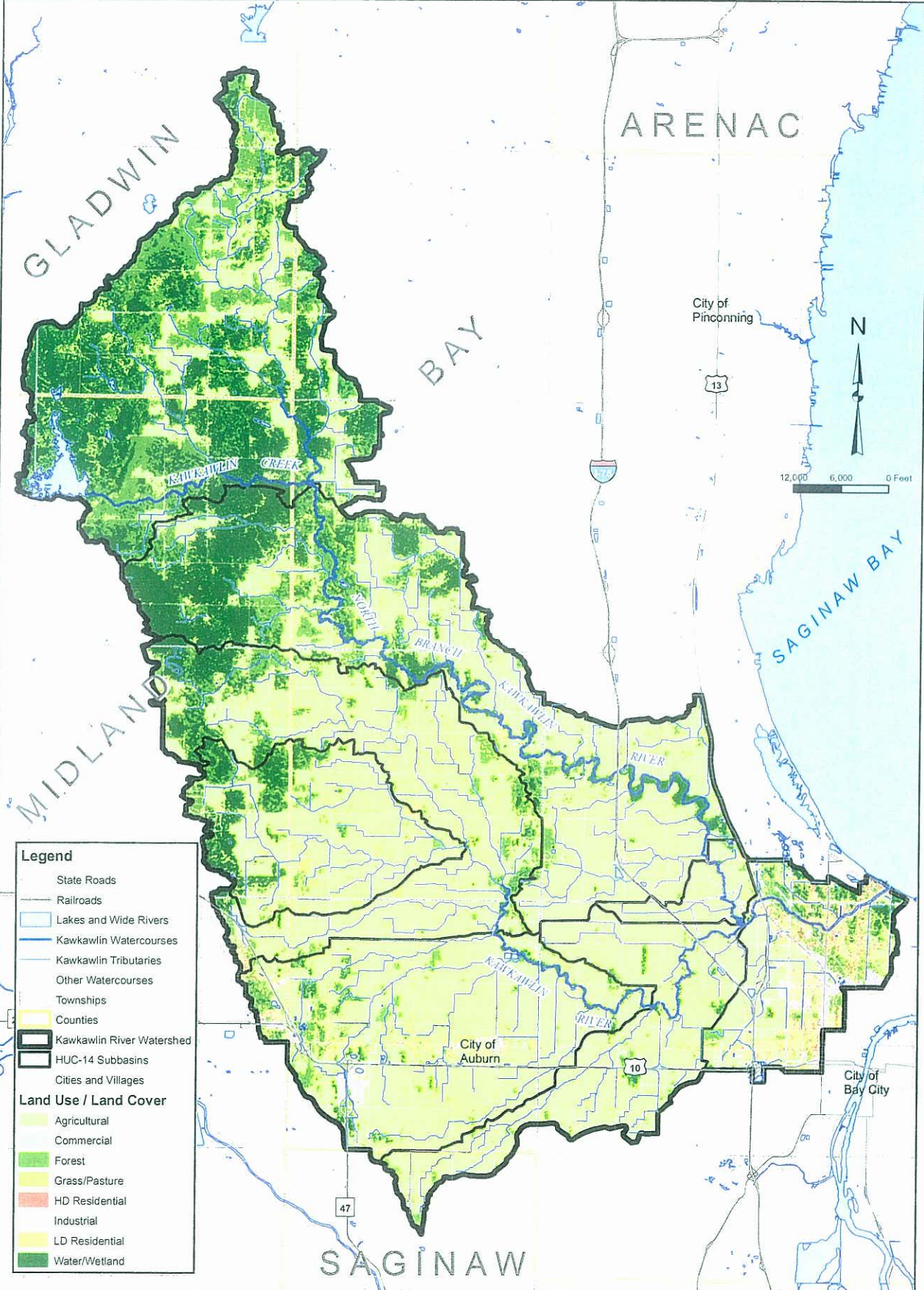
KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

DR. BY: MMC	CHK. BY: RAB	PROJECT NO.
DE. BY: MMC	APP. BY: RAB	117345SG2008
DATE: AUGUST, 2009	FILE NO.	F-1090-07
OFFICE LOCATIONS		SHEET 1 OF 1
SAGINAW, MI	ST. JOHNS, MI	
CARO, MI	DETROIT, MI	
TEMPE, AZ		

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**Legend**

- State Roads
- Railroads
- Lakes and Wide Rivers
- Kawkawlin Watercourses
- Kawkawlin Tributaries
- Other Watercourses
- Townships
- Counties
- Kawkawlin River Watershed
- HUC-14 Subbasins
- Cities and Villages

**Land Use / Land Cover**

- Agricultural
- Commercial
- Forest
- Grass/Pasture
- HD Residential
- Industrial
- LD Residential
- Water/Wetland



JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER  
 EXHIBIT 8  
 LAND USE / LAND COVER 1992

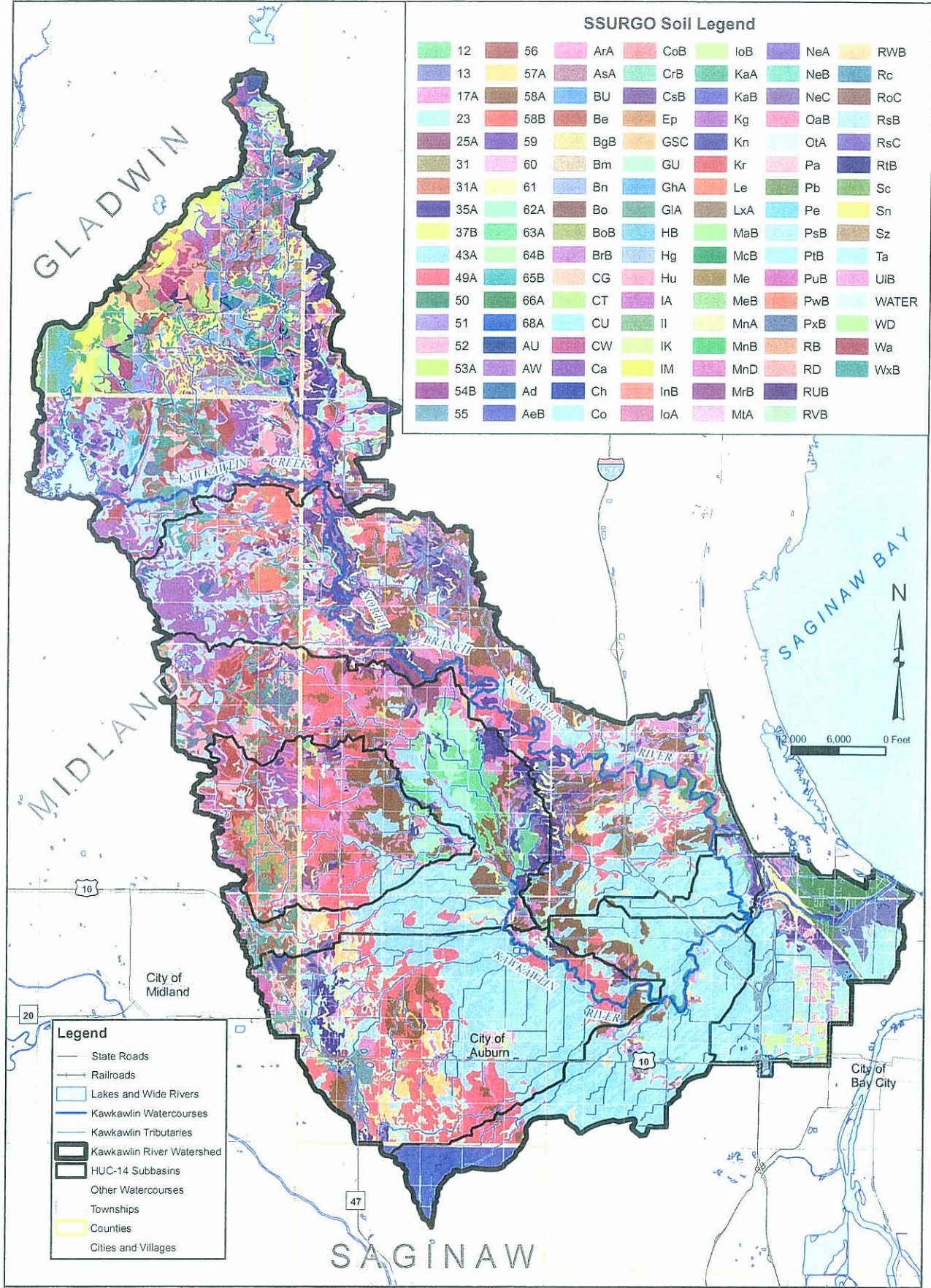
KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

DR. BY: MMC	CHK. BY: RAB	PROJECT NO.
DE. BY: MMC	APP. BY: RAB	117345SG2008
DATE: AUGUST, 2009	FILE NO.	F-1090-08
		SHEET 1 OF 1

OFFICE LOCATIONS  
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### SSURGO Soil Legend

12	56	ArA	CoB	IoB	NeA	RWB
13	57A	AsA	CrB	KaA	NeB	Rc
17A	58A	BU	CsB	KaB	NeC	RoC
23	58B	Be	Ep	Kg	OaB	RsB
25A	59	BgB	GSC	Kn	OIA	RsC
31	60	Bm	GU	Kr	Pa	RtB
31A	61	Bn	GhA	Le	Pb	Sc
35A	62A	Bo	GlA	LxA	Pe	Sn
37B	63A	BoB	HB	MaB	PsB	Sz
43A	64B	BrB	Hg	McB	PtB	Ta
49A	65B	CG	Hu	Me	PuB	UIB
50	66A	CT	IA	MeB	PwB	WATER
51	68A	CU	II	MnA	PxB	WD
52	AU	CW	IK	MnB	RB	Wa
53A	AW	Ca	IM	MnD	RD	WxB
54B	Ad	Ch	InB	MrB	RUB	
55	AeB	Co	IoA	MIA	RVB	

#### Legend

- State Roads
- Railroads
- Lakes and Wide Rivers
- Kawkawlin Watercourses
- Kawkawlin Tributaries
- Kawkawlin River Watershed
- HUC-14 Subbasins
- Other Watercourses
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- Counties
- Cities and Villages



JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER  
 EXHIBIT 9  
 SSURGO SOILS  
 KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

DR. BY: MMC	CHK. BY: RAB	PROJECT NO. 117345SG2008
DE. BY: MMC	APP. BY: RAB	
DATE: AUGUST, 2009	FILE NO. F-1090-09	SHEET 1 OF 1
OFFICE LOCATIONS SAGINAW, MI ST. JOHNS, MI CARO, MI DETROIT, MI TEMPE, AZ		<b>Spicer group</b> SAGINAW OFFICE 230 S. WASHINGTON AVE. SAGINAW, MI 48605 TEL. 989-754-4717 FAX 989-754-4440 www.SpicerGroup.com



- Legend**
- State Roads
  - Railroads
  - Lakes and Wide Rivers
  - Kawkawlin Watercourses
  - Kawkawlin Tributaries
  - Other Watercourses
  - Townships
  - Counties
  - Kawkawlin River Watershed
  - HUC-14 Subbasins
  - Cities and Villages
- Kawkawlin STATSGO Soils**
- BELLEVILLE-PIPESTONE-WIXOM
  - ESSEXVILLE-TAPPAN-AQUENTS
  - IOSCO-BREVORT-GLADWIN
  - KINGSVILLE-PIPESTONE-COVERT
  - LENAWEE-PARKHILL-PIPESTONE
  - LONDO-TAPPAN-WIXOM
  - PARKHILL-CAPAC-LONDO
  - PIPESTONE-COVERT-TOBICO
  - ROSCOMMON-AU GRES-IOSCO



JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER

EXHIBIT 10  
 STATSGO SOILS

KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

DR. BY: MMC    CHK. BY: RAB  
 DE. BY: MMC    APP. BY: RAB

DATE: AUGUST, 2009

OFFICE LOCATIONS  
 SAGINAW, MI  
 ST. JOHNS, MI  
 CARO, MI  
 DETROIT, MI  
 TEMPE, AZ

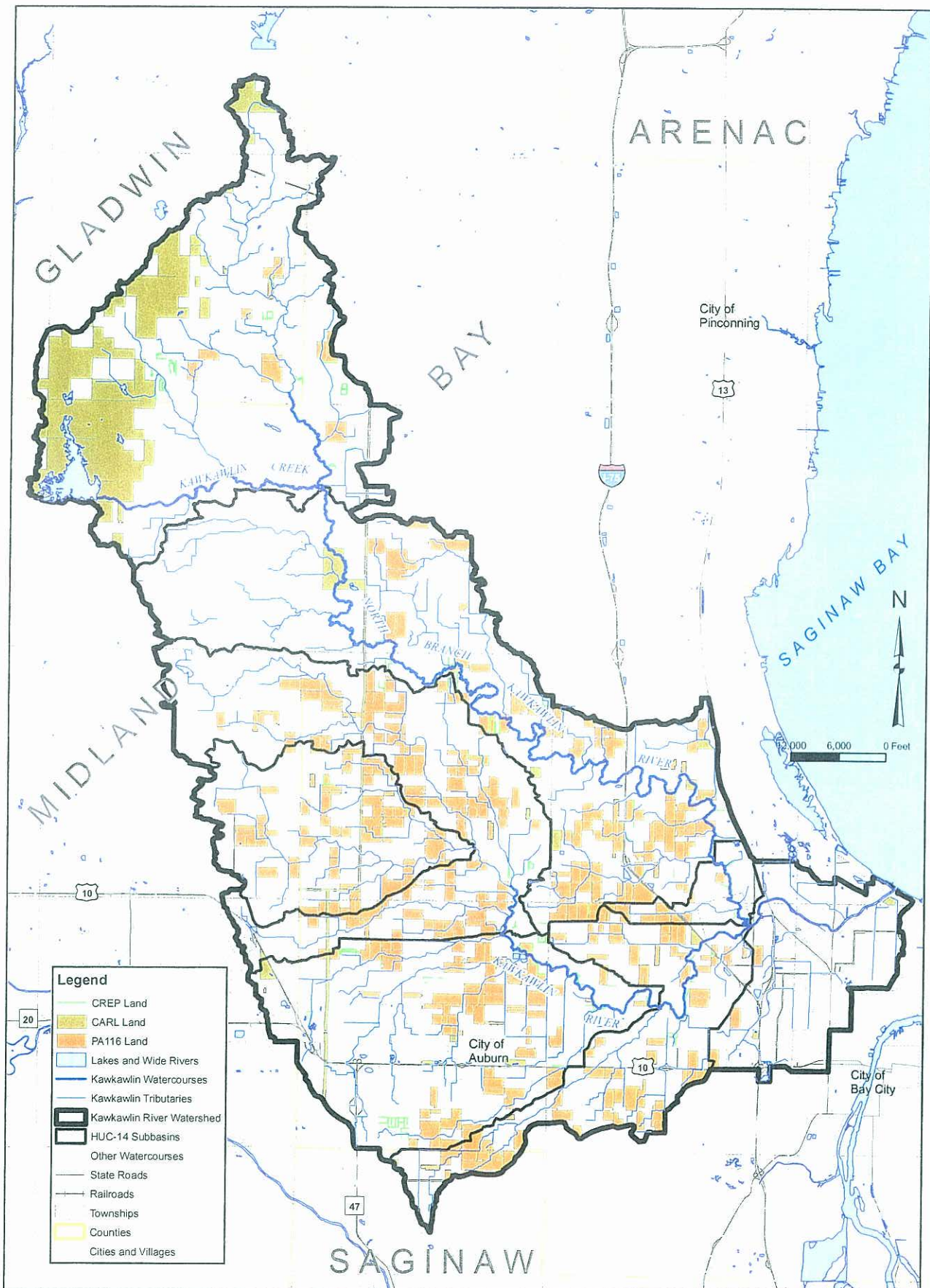
PROJECT NO.  
 117345SG2008

FILE NO.  
 F-1090-10


**Spicer**  
 group

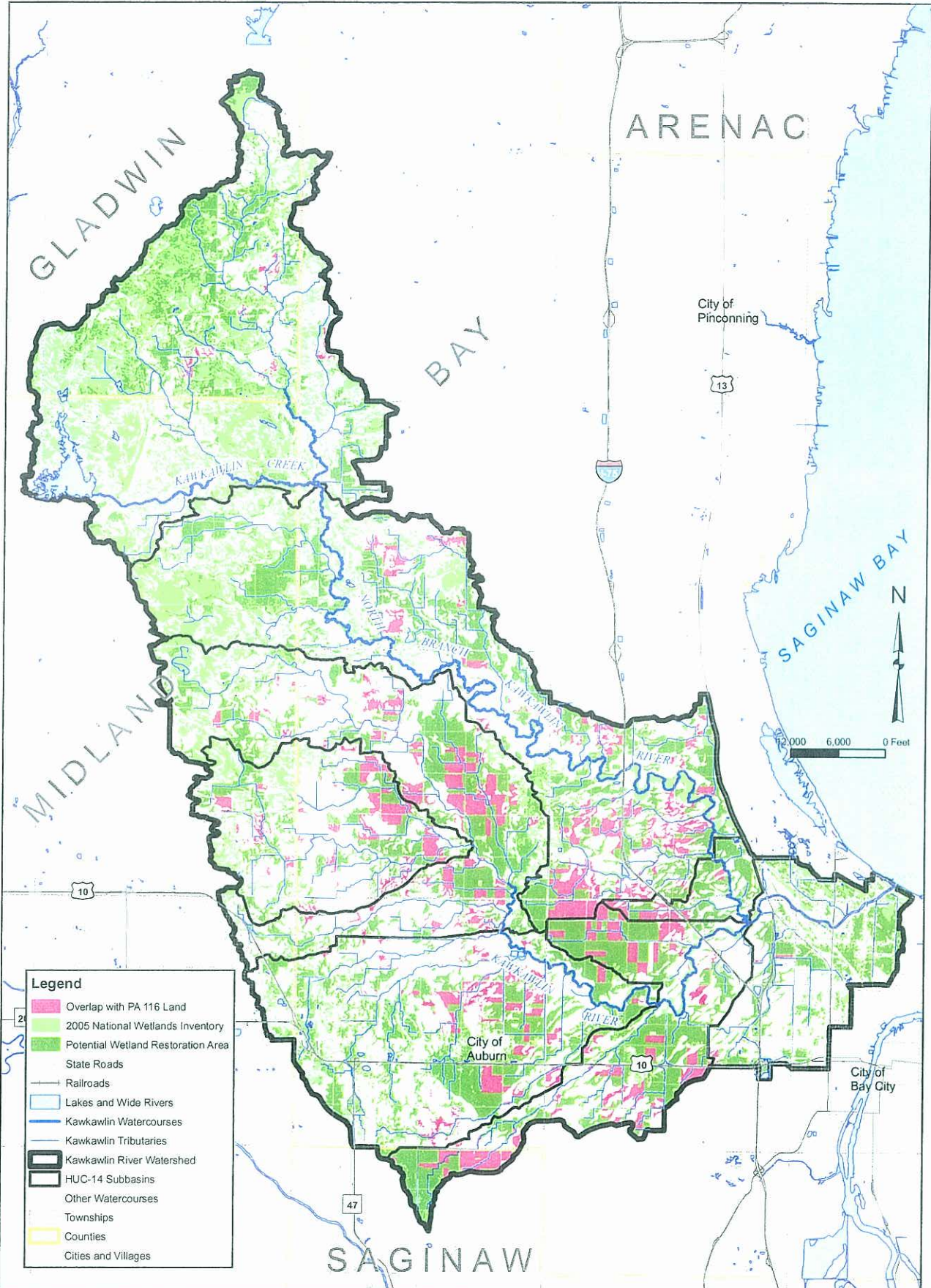
SHEET 1 OF 1

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- Legend**
- CREP Land
  - CARL Land
  - PA116 Land
  - Lakes and Wide Rivers
  - Kawkawlin Watercourses
  - Kawkawlin Tributaries
  - Kawkawlin River Watershed
  - HUC-14 Subbasins
  - Other Watercourses
  - State Roads
  - Railroads
  - Townships
  - Counties
  - Cities and Villages

	<b>JOSEPH RIVET</b> BAY COUNTY DRAIN COMMISSIONER	DR. BY: MMC    CHK. BY: RAB DE. BY: MMC    APP. BY: RAB	PROJECT NO. 117345SG2008
	<b>EXHIBIT 11</b> LAND CONSERVATION PROGRAMS	DATE: AUGUST, 2009    FILE NO.    F-1090-11	SHEET 1 OF 1
KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES MICHIGAN		<b>Spicer</b> group	SAGINAW OFFICE 230 S. WASHINGTON AVE. SAGINAW, MI 48605 TEL. 989-754-4717 FAX 989-754-4440 <a href="http://www.SpicerGroup.com">www.SpicerGroup.com</a>



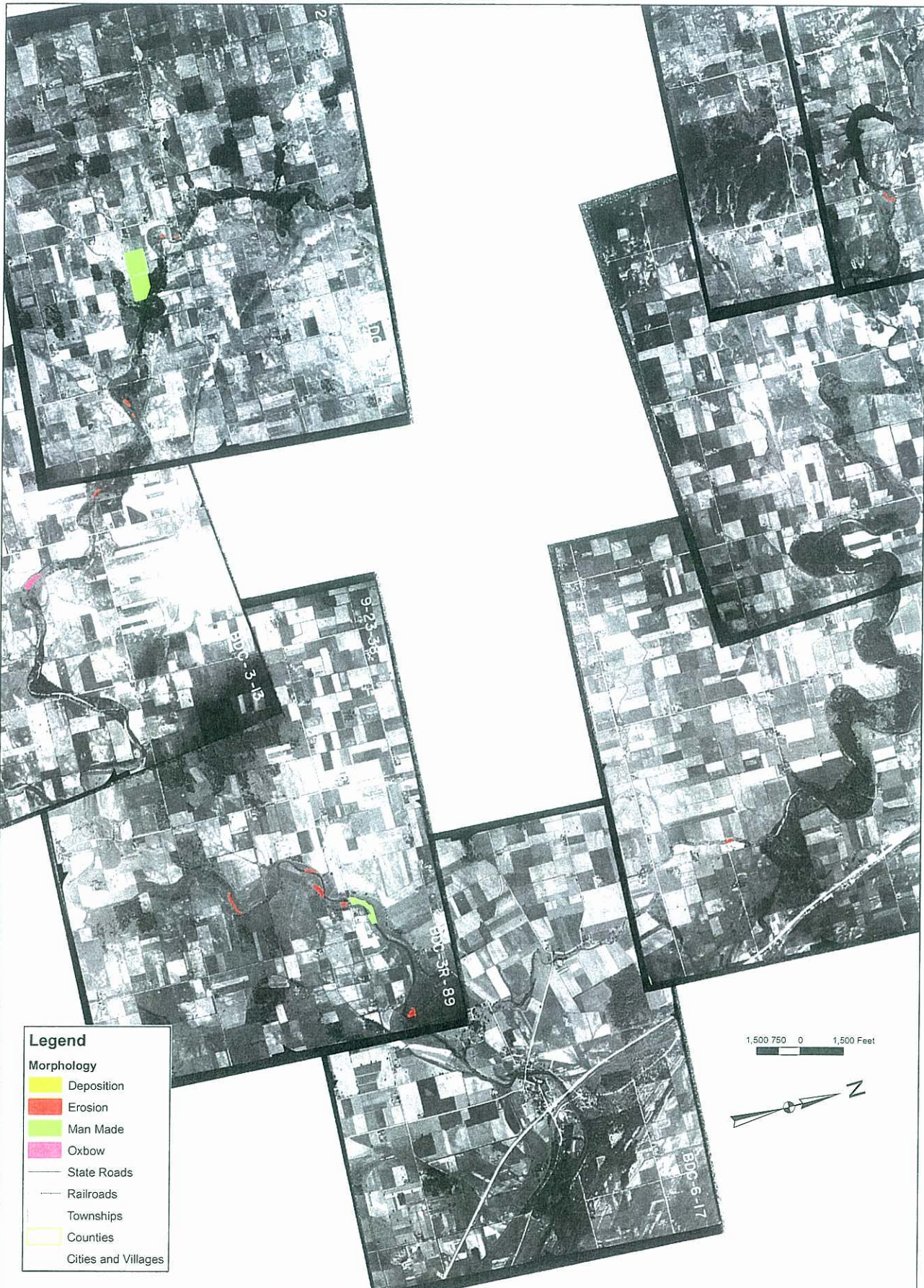
**Legend**

- Overlap with PA 116 Land
- 2005 National Wetlands Inventory
- Potential Wetland Restoration Area
- State Roads
- Railroads
- Lakes and Wide Rivers
- Kawkawlin Watercourses
- Kawkawlin Tributaries
- Kawkawlin River Watershed
- HUC-14 Subbasins
- Other Watercourses
- Townships
- Counties
- Cities and Villages



JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER  
 EXHIBIT 12  
 POTENTIAL WETLAND  
 RESTORATION AREAS  
 KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

DATE: AUGUST, 2009	DR. BY: MMC    CHK. BY: RAB DE. BY: MMC    APP. BY: RAB	PROJECT NO. 117345SG2008	SHEET 1 OF 1
OFFICE LOCATIONS SAGINAW, MI ST. JOHNS, MI CARO, MI DETROIT, MI TEMPE, AZ			
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**Legend**

**Morphology**

- Deposition
- Erosion
- Man Made
- Oxbow
- State Roads
- Railroads
- Townships
- Counties
- Cities and Villages



JOSEPH RIVET  
 BAY COUNTY DRAIN COMMISSIONER  
 EXHIBIT 13  
 CHANNEL MORPHOLOGY

KAWKAWLIN RIVER WATERSHED MANAGEMENT PLAN  
 GLADWIN, MIDLAND, SAGINAW, & BAY COUNTIES  
 MICHIGAN

SCALE: 1"= 1,500'

DATE: SEPT., 2008

OFFICE LOCATIONS  
 SAGINAW, MI  
 ST. JOHNS, MI  
 CARO, MI  
 DETROIT, MI  
 TEMPE, AZ

DR. BY: MMC CHK. BY: XXX  
 DE. BY: MMC APP. BY: XXX

FILE NO. F-1090-13



PROJECT NO.  
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