INTRODUCTION

The purpose of this Stormwater Action Plan (SAP) is to provide the Borough of Indiana with a comprehensive planning document that provides basic information and guidance necessary for the sound stewardship of the municipal storm drainage system and watercourses. This plan is important because it:

- Compiles basic information relevant to the storm drainage system and watercourses.
- Highlights known deficiencies.
- Describes and graphically illustrates recommended improvements.
- Presents basic cost information for general budgeting and the development of an adoptable 20-year capital improvement plan (CIP).
- Provides a physical tool for informing decision-makers, individual citizens and other interested parties of the existing system and proposed improvements.
- Serves as a valuable resource for gaining public support for needed improvements.
- Facilitates logical planning decisions relative to other Borough programs.

HOW THIS PLAN SHOULD BE USED

This SAP should be used in the following manner:

- Viewed as a dynamic working document.
- Reviewed annually to adjust priorities and budgets.
- Regarded as having conceptual recommendations and planning level estimates.
- Updated periodically to:
    - incorporate data of new development and system upgrades.
    - identify recommendations to be further investigated for funding and analyzed in design.
    - Adjust and refine cost estimates by moving concepts to design.
- Used to guide future storm drainage system improvements.

AUTHORIZATION

The Borough of Indiana authorized Stiffler, McGraw & Associates, Inc. (SMA) to prepare this SAP. This report documents the stormwater action planning work that was conducted under this professional services agreement.

COMPLIANCE

This plan supports the Borough's obligations under Pennsylvania's regulations and policies pertaining to stormwater management public facilities planning rules.

STUDY AREA AND STUDY PERIOD

To date, the study has focused on compiling and organizing information from past investigations and observations. This has included damage reports from past flooding, observations by Borough staff and property owners, a flood mitigation study of Marsh Run performed by the Pennsylvania Department of Environmental Protection, periodic inspections of existing structures, and repairs to existing infrastructure.

Infrastructure facilities studied were confined to those within the Borough. However, the area contributing drainage to those Borough facilities extends outside the corporate limits and has been included in the various studies with due consideration of the existing development types and ongoing development patterns. The major watercourses within the Borough are Stoney Run, Whites Run, and Marsh Run, each of which originate north of the Borough within neighboring White Township.

As problem areas were identified, projects to address adverse conditions were conceptualized. Design, permitting, construction costs and durations were estimated for the respective projects. Initially, twenty (20) projects were identified by Borough staff. A qualitative ranking was performed by the staff using a rubric to evaluate flooding and construction impacts, public relations, construction and maintenance costs, funding / assistance and necessity for each. Scores were assigned to each of the applicable evaluation parameters and a project score was determined.

Fourteen (14) of the projects were then ranked for priority (refer to the "Project Listing"). As the project list was compiled, costs were estimated for the anticipated design tasks, right-of-way acquisition, legal consultation, and construction. The duration for each was also estimated. The resulting matrix yielded a cost versus time listing for each project.

Each project was then plotted on a bar chart. A "start date" was assigned to create a graphical plot that shows each project activity with respect to date.

Finally, a "Cash Flow" tabulation was produced that showed the cost for each project on a yearly basis. A review of this data will facilitate schedule changes to spread out or consolidate costs to meet yearly budgets. The three data presentations, the Project Listing, the Bar Chart, and the Cash Flow tabulation are linked in a spreadsheet that allows iterations to be performed to optimize the planning effort.

PURPOSE AND COMPLIANCE

The purpose of this master plan effort is to examine and compile the condition of the Borough's storm drainage facilities and report on the requirements for current and future conditions. The action plan documents the results of evaluations of the facilities under current and forecasted development conditions to identify operational limitations and to recommend improvements

necessary to accommodate the Borough's stormwater needs through the 20-year planning period.

Recommendations presented for improvements consider general conditions and observed capacity inadequacies and problem areas within the Borough's stormwater infrastructure.

REGULATORY CONSIDERATIONS

Phase I of the U.S. Environmental Protection Agency's (EPA) stormwater program was promulgated in December 1990 under the Clean Water Act (CWA). Phase I relies on National Pollutant Discharge Elimination System (NPDES) permit coverage to address stormwater runoff from: (1) "medium" and "large" municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater, (2) construction activity disturbing 5 acres of land or greater, and (3) ten (10) categories of industrial activity.

The Phase II program expanded the Phase I program by requiring additional operators of MS4s in urbanized areas and operators of small construction sites, using NPDES permits, to implement programs and practices to control polluted stormwater runoff. Phase II was intended to further reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated sources of stormwater discharges that have the greatest likelihood of causing continued environmental degradation.

Currently, Indiana Borough is not an MS4-regulated community. The Borough's population puts it under the threshold for required evaluation. It is unlikely that the Borough will be regulated in the near future as an MS4 because:

- The Borough is not currently experiencing a high growth rate. This trend is expected to continue during the near future.
- The Borough is not part of a defined urbanized area nor will it be in the foreseeable future.

STORMWATER QUALITY MANAGEMENT

Without an NPDES permit or a final Total Maximum Daily Load (TMDL) study there is no formal regulatory framework to establish water quality standards for the Borough's storm drainage system. ("TMDL" is a regulatory term in the U.S. Clean Water Act, describing a plan for restoring impaired waters that identifies the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards.) However, the Borough has incorporated (with some modifications) the model ordinance developed by the DEP for MS4 communities wherein water quality provisions are required in new development proposals.

NPDES Permits for Stormwater Discharges Associated with Construction Activities, required by DEP for projects involving earthmoving activities equal to or greater than one acre, require that both peak rate and water quality best management practices be incorporated into projects.

The Borough can, separately or jointly with other municipalities, undertake projects with stormwater treatment benefits, such as open ditch conveyance, constructed wetlands, rain gardens, or detention facilities to reduce peak discharge rates and improve water quality. In addition, programs can be identified to reduce impervious areas and create riparian buffers, and incorporated public green spaces to further reduce runoff rates and improve water quality.

EXISTING CONVEYANCE SYSTEM OVERVIEW

The Borough's stormwater system collects and conveys runoff from developed and undeveloped properties from both inside and outside of the Borough. The system consists of a wide range of facilities, including natural channels, underground storm drainage piping, roadside ditches, culverts and constructed open channels.

In general, the Borough's drainage facilities were designed without guidance from an overall storm drainage plan. Some creek drainage paths were altered to accommodate development. Historic development patterns included substantial construction within the flood plains. Some construction extends to the tops of stream banks while other development was made possible by the enclosing of natural watercourses. Over time, localized flooding issues were addressed by solutions that may not have considered the potential impacts on the upstream and downstream parts of the system.

ANALYSIS METHODOLOGY

The stormwater analysis consists of hydrologic and hydraulic components. The hydrologic component estimates the volume and peak flow rate of stormwater runoff entering the stormwater conveyance system in response to the rainfall associated with a specific design storm. The total volume and peak flow rate of stormwater runoff depends on the duration and intensity of the storm, the topography, soil type and the amount of saturation, and amount of impervious area within the watershed.

The hydraulic component "routes" the runoff (quantified in the hydrologic component) through the conveyance system. Hydraulic calculations evaluate how surface, and/or subsurface flows move from one point to the next in the conveyance system by considering the geometry (size, shape and slope), roughness, uniformity, and other features that affect the rate of movement. Hydraulic analyses quantify the capacity of specific sections of rivers, streams, and storm sewer networks from which flood-prone areas and inadequate facilities can be identified.

STORMWATER SYSTEM OVERVIEW

A stormwater system overview is recommended to provide the following insight:

- Identify data gaps in the Borough stormwater facility records,
- Assist in identifying causes of observed historical flooding,
- Identify potential flooding areas that have not been identified previously, and
- Assist in developing projects to improve Borough stormwater facilities.

The effort on this plan to-date has focused on reviewing the Borough's stormwater infrastructure facilities and to identify and prioritize projects that are most critical and can be funded within the budgetary constraints and the existing grant programs.

IMPROVEMENT OPTIONS

There are generally two types of improvement options considered for stormwater improvements: structural and non-structural. An example of a structural improvement is the construction of a diversion pipe around a flow restriction. A non-structural improvement could include cleaning of catch basins to reduce the conveyance of sediment to areas downstream. The Borough typically relies on a combination of both structural and non-structural improvements to provide cost-effective stormwater management.

Preferred alternatives were selected for each improvement required for the Borough's 20-year CIP, and focused on structural improvements. The improvement options are as follows:

Increase Pipe Capacity. Increasing pipe capacity is the traditional approach to increasing overall stormwater system conveyance.

Increase Capacity of Natural Channel. Where capacity in natural channels may be limited, increasing capacity can be approached in two ways. Larger flows can be accommodated by increasing the cross-sectional area of the channel or by reducing the frictional resistance of the channel.

Increasing cross-sectional area typically requires increasing the width, because channel depth is often limited by the available elevation drop in the system. Given the dense development within much of the Borough and proximity of development to the streams, widening of the channel is practical in only selected areas.

Frictional resistance can be improved through routine maintenance, such as clearing vegetation, or by cleaning or resurfacing the channel. However, reducing the friction necessarily creates higher velocities which must be carefully considered in order to avoid scour and erosion.

Construct Detention Facilities. Detention facilities temporarily store peak stormwater runoff from a developed area and then discharge the water to the receiving system at a lower, controlled rate. This is traditionally performed where an analysis demonstrates the downstream conveyance system may be overburdened by increased flow.

Low-Impact Development Approaches (LIDA). LIDA are methods for stormwater management which are intended to reduce the impact of stormwater runoff from a development's impervious surfaces to the natural environment. This is accomplished through the reduction of peak runoff rates from impervious surfaces such as building roofs or pavement, and through infiltration, which reduces the overall volume of runoff. Examples of LIDA include vegetated infiltration swales, pervious asphalt and concrete pavements, eco-roofs, vegetated filter strips and "green streets."

RECOMMENDED IMPROVEMENTS

Presented below are recommended storm drainage system improvements comprised of preliminary project descriptions, costs and prioritizations. The recommended facility sizes and locations designated in this action plan are preliminary only. During final design of facilities, design flows, pipe sizes, elevations and routing schemes will be determined, based upon the current land use plan, proposed development, soil surveys, soil investigations, physical constraints and other relevant field conditions.

Additional Recommendations

Additional recommendations are as follows:

- ***Additional Studies Recommended.*** Several deficiencies were identified during the hydraulic modeling portion of the study that showed some potential that a capacity deficiency may exist, but the effect was determined to be minor surcharging only, and therefore did not warrant improvements at this time. Further detailed study is recommended before undertaking improvements or allowing further development upstream of these deficiency areas.
- ***Local Improvement Fund.*** It is anticipated that relatively small, localized drainage problems will need to be addressed by Borough crews on an annual basis. Based on Borough staff input, an annual budget of approximately $100,000 is suggested to address such problems.
- ***Stormwater Action Plan Update.*** This stormwater action plan should be updated approximately every three years following adoption. A cost of $10,000 should be budgeted for the first Stormwater Action Plan update. Update costs should be incremented by 10% for every three-year update.
- ***As-built Survey Program and Record Keeping.*** Data gaps in the Borough's stormwater system records were identified during the development of this action plan. This information is helpful to accurately define the existing system and develop future storm drainage improvements. An annual cost of $5,000 over five years (assuming three percent yearly annual inflation) is recommended for inclusion in a storm drainage capital improvement program to develop a systematic as-built survey program that can be used to enhance the existing stormwater system maps. In addition to an as-built surveying program, the Borough should require developers to submit as-built drawings in digital format after new projects are completed. Data from these drawings should be added to the Borough's stormwater system maps.

GENERAL IMPROVEMENT OPTIONS

The following general improvements can be undertaken to alleviate flooding conditions within the Borough:

- Increase capacity of natural channel

- Construct detention facilities
- General storm sewer replacement

LISTING OF SPECIFIC PROJECTS

The following specific projects have been identified as those that are currently most-critical and in need of further evaluation to formulate a scope to estimate costs, establish a ranking as to priority, and consider for programming financial resources:

- Philadelphia Street / Marsh Run Culvert (Currently being undertaken by PennDOT)
- Dredge Water Street (First Ward) Stormwater Detention Facility (Currently being evaluated using CDBG Funding)
- Enlarge Water Street (First Ward) Stormwater Detention Facility (Currently being evaluated using CDBG Funding)
- S. 7th Street Storm Sewer Improvements (Currently being designed using CDBG funding)
- S. 15th Street Culvert Replacement Project (Currently being designed using CDBG Funding)
- Marsh Run Gabion Replacement – Downstream of Washington Street
- Streambank Stabilization – Coulter to Poplar Avenues
- Streambank Stabilization – Willow Avenue to 7th Street
- Marsh Run Daylighting – Burns to Nixon Avenues
- Willow Avenue / Marsh Run Culvert Cleaning
- Willow Avenue Channel Alignment & Bank Stabilization
- 5th Street Bridge Approach Channel Stabilization
- W. Maple Street to Carter Avenue Vegetation & Scrap Removal
- N. 4th Street Culvert Replacement
- S. Rex Avenue / Gompers Avenue Storm Sewer

FUNDING SOURCE REVIEW

The funding sources that are generally available include:

Outside Funding Assistance

- PA Department of Community and Economic Development (DCED)
- Community Development Block Grant (CDBG)
- Rural Utilities Service (RUS) Water and Waste Disposal Program
- Economic Development Administration Public Works Grant Program
- Local Funding Through System Development Charges
- Local Funding Sources
- Fee-in-lieu-of Charges for On-Site Detention
- Storm Drainage System Fees

POTENTIAL FINANCIAL IMPACTS OF IMPROVEMENT PROGRAM

The estimated total costs for the recommended capital improvements through the end of the 20-year study period are found in the Appendix in the "Project Listing" exhibit. An annual increase of roughly 3% should be applied to this estimate for future budgeting purposes. As listed in the previous section, several funding options are available to help finance the recommended improvements. Storm drainage system fees are currently not provided for in the Borough's code of ordinances. However, they could be instituted following a comprehensive financial evaluation of the improvement program goals, priorities, and timeline to implement storm drainage system improvement recommendations presented herein or as modified in the future.

GENERAL IMPROVEMENT OPTIONS

INCREASE CAPACITY OF NATURAL CHANNEL

There are two ways to increase natural channel capacity. The first is by increasing the cross-sectional area of the channel. This typically works by increasing the width of the channel. The second way will accommodate larger flows by reducing the frictional resistance of the channel. One way to do this is with the improvement of routine maintenance, such as clearing vegetation, or cleaning/resurfacing the channel.

In the 1997 DEP study, a trapezoidal, rock-lined channel for Marsh Run was recommended. The channel would have 1 on 1 side slopes and be lined with gabion baskets filled with R-3 rock or an equivalent alternative.

To minimize costs to the Borough, the existing bridges would be utilized as much as possible and removing private buildings and walls would be avoided. The channel would vary throughout to provide as much width as possible and to meet the width of the existing bridges, structures, and walls. Most property owners adjacent to Marsh Run would lose some property to the expanded channel.

Channel improvements would begin at Chestnut Street by replacing the culvert with a 650-foot long, reinforced concrete box culvert having a width of 8 and a height of 4 feet. From Oak Avenue to Water Street, the bottom of the trapezoidal channel would be 8 feet wide. The culvert under Water Street would be replaced with a 150-foot long concrete box culvert, 8 feet wide by 4 feet high. The length of the culvert would be shortened as much as possible. The alignment of the new culvert would run between two homes on Water Street, cross under Water Street, and join with the existing masonry channel adjacent to Cherry Alley.

If the width is insufficient to place the culvert between the two homes, one of the homes would need to be purchased and demolished. The length of culvert can be shortened to the width of Water Street if one of the homes is removed. From Water Street downstream to the confluence with the East Avenue tributary, the channel bottom width would be 8 feet. From the tributary downstream to below Philadelphia Street, the channel would be 14 feet wide. From Gompers

Street down to Carter Avenue, the channel bottom width would be 20 feet except in those areas where local conditions require less. The bridges at Willow Street, Philadelphia Street and Burns Alley are inadequate and need to be replaced.

The Marsh Run channel currently has the capacity to pass a 5-year flood. The trapezoidal, rock-lined channel would increase the capacity to a 25-year flood. A wider channel would be required to increase flood protection above the 25-year level.

Cost Estimate: $1.1 million (1997); $2.2 million (2020) *

***costs inflated from 1997 study by 3% annually; scope needs to be re-examined.**

CONSTRUCT DETENTION FACILITIES

Detention facilities work by temporarily impounding runoff from a developed area, thereby delaying and reducing the magnitude of peak discharges. The reduced rate of discharge decreases the amount of flow that must be carried by the stormwater conveyance facilities downstream.

The timing delay can be particularly effective, especially in urbanized watersheds, where the runoff from the watershed extremes tends to reach the ditches, storm sewers and streams at nearly the same time, exacerbating the combined discharge rate. Thus, delaying the "peak" from portions of the watershed until contributions from the remaining portions have begun to recede will prolong high stream-flow conditions but generally at a lower, maximum depth.

While highly-urbanized areas can benefit from stormwater detention facilities, built-out municipalities like the Borough, have little open or available space for this kind of construction. Targeted property acquisition could make detention facility construction a viable option.

GENERAL STORM SEWER REPLACEMENT

For programming replacement of the storm sewer system within the Borough, the following estimate is provided on a "per block" basis:

Cost Estimate Per Block (February 2014)

Item Description	Qty.	Unit	Unit Price	Item Price
15" Storm Sewer	750	L.F.	$65	$48,750
Catch Basins	6	EA.	$2,500	$15,000
Special Backfill	350	C.Y.	$35	$12,250
Asphalt Pavement (Trench Width)	400	S.Y.	$65	$26,000
Concrete Curb	1300	L.F.	$45	$58,500

ADA Sidewalk Aprons	8	EA.	$3,500	$28,000
6" Base Drain	650	L.F.	$20	$13,000
			Subtotal	$201,500
	Soft Costs		25%	$50,375
			Total	$251,875

Assumptions:

Average Block = 650 feet
6 Inlets Per Block
3 Cross Pipes Per Block
15" Size Storm Sewer (Minimum)
New Curb Installed on Both Sides of Street

ESCALATION DUE TO INFLATION

ASSUMED RATE / YR. AT 3%:		**YEAR**	**COST**
	3%	2020	$300,752
	3%	2021	$309,774
	3%	2022	$319,068
	3%	2023	$328,640
	3%	2024	$338,499
	3%	2025	$348,653
	3%	2030	$404,185

LISTING OF SPECIFIC PROJECTS

PHILADELPHIA STREET / MARSH RUN CULVERT

There is an area near Philadelphia Street where floodwaters overtop the streambanks and inundate adjacent low-lying areas. Several factors contribute to this flooding problem. The Philadelphia Street bridge opening measures 10 feet by 4 feet and is inadequate. Immediately upstream of Philadelphia Street, an unnamed tributary enters Marsh Run at a right angle. This causes a turbulent flow pattern at the junction of the two streams. Immediately downstream of Philadelphia Street, the flow turns sharply into a channel having a constricted width. This causes additional backwater through the bridge. These factors all work against an efficient flow pattern through this reach. As a result, floodwater flow is at a higher depth.

The bridge at Philadelphia Street should be replaced and the channel immediately upstream and downstream should be modified. The channel modifications would include the confluence of

Marsh Run and an unnamed tributary, and enlarging the channel at the downstream side of the bridge. Maintaining the stormwater detention basin at East avenue will also help reduce flooding problems at Philadelphia Street.

(Note: This project is being undertaken by PennDOT. The proposed structure is a 16'-wide by 4'-6"-high concrete box culvert.)

DREDGE WATER STREET (FIRST WARD) STORMWATER DETENTION FACILITY

There is a stormwater detention facility located near the intersection of Water Street and 1st Street Indiana, PA. The facility is maintained by White Township and Indiana Borough on a rotational basis.

In 2005 plans were made to dredge the Water Street detention facility. The project included the removal and disposal of all sediment and debris from the facility. Engineers estimated that approximately 900 cubic yards of material would be removed. A defined stream channel was constructed and the area outside of the fence was restored to a mowable condition. Including change orders, the project cost was $21,000. If a similar project is undertaken in 2020, the estimated cost is $32,754.

Cost Estimate:

Year	Cost Estimate (3% per year)
2020	$32,754
2021	$33,737
2022	$34,749
2023	$35,791
2024	$36,865
2025	$37,971
2030	$44,019

Timeframe:

Priority: 1 (Unless facility can be enlarged – see below)

ENLARGE WATER STREET (FIRST WARD) STORMWATER DETENTION FACILITY

Another potential project is one which would enlarge the existing detention facility. This project would add approximately 63,000 cubic feet of storage (1.5 acre-feet). The construction costs associated with this project are estimated at $215,000. Design, permitting, and bidding costs would be at an additional $50,000. Assuming a 10% contingency, the total project cost is estimated as $291,500 (2020).

The enlargement of the facility will most likely be most effective for more-frequent / less severe storms. However, further analysis would need to be conducted in order to ensure that most efficient design and implementation.

Year	Cost Estimate (3% per year)
2020	$291,500
2021	$300,245
2022	$309,252
2023	$318,530
2024	$328,086
2025	$337,928
2030	$391,752

Timeframe:

Priority: 1

S. 7TH STREET STORM SEWER IMPROVEMENTS

The existing storm sewer in South 7th Street between Grant Street and Marsh Run is inadequate. Replacement pipe, having a length of approximately 380 feet and a diameter of 24 inches, will need to be installed along with an estimated five inlets to capture and properly convey runoff.

November 20, 2017

ITEM	QTY	UNIT	UNIT PRICE	ITEM PRICE
Storm Sewer Piping	380	L.F.	$75	$28,500
Pavement Replacement (Trench)	250	S.Y.	$60	$15,000
Special Backfill	250	C.Y.	$25	$6,250
2' x 4' Inlet Boxes	5	EACH	$2,250	$11,250
			Total	$61,000

Cost Estimate: The estimated construction cost of this project is $6,656 (2020.)

Year	**Cost Estimate (3% per year)**
2020	$66,656
2021	$68,656
2022	$70,715
2023	$72,837

Year	Cost Estimate (3% per year)
2024	$75,022
2025	$77,273
2030	$89,580

Timeframe:

Priority: 2

SOUTH 15TH STREET CULVERT REPLACEMENT PROJECT

This project is the design, permitting, bidding, construction and resident project representation (construction inspection) of a six hundred (600) foot long portion of culvert replacement within the westerly portion of the Borough of Indiana. The project is expected to be designed, bid, and constructed in two phases. The permitting is expected to be performed within the first phase.

The project is located just west of South Fifteenth Street. The upstream limit is about 60 feet north of Gompers Avenue and the downstream limit is approximately 160 feet south of Church Street.

The drainage area is estimated at 205 acres and the anticipated design frequency is expected to be the 100-year storm. The 100-year design discharge is estimated at 250 cubic feet per second.

The replacement culvert is expected to be a 66”-diameter pipe. Because of limited depth, a horizontal elliptical pipe measuring 83” by 53” may be specified. To limit the costs, only four inlets are anticipated, the locations of which will be specified to facilitate deflections in the culvert alignment.

The project is broken into two phases due to the overall cost. The project goal of replacing existing deteriorated 36”-diameter corrugated metal pipe can be accomplished by completing the downstream portion first (“Phase 1”) and making a temporary tie-in to the existing system. “Phase 2” would tie into the upstream end of Phase 1 and would complete the upstream portion.

Public sewer, water, and natural gas facilities are located throughout the involved street rights-of-way. Facility relocations are anticipated.

Design is expected to take approximately three months and following that, the permitting process will likely take an additional twelve-months. Each phase is expected to take approximately two months to construct. A single-phase project would likely be completed in a total of three months.

Cost Estimate: The estimated construction cost for the project is approximately $539,422 including a 5% contingency. The engineering, permitting, bidding and inspection costs associated

with the project are estimated at $99,000. Right-of-way and legal costs are estimated at $28,000. The total estimated cost of the total project is $666,422 (2020).

Year	Cost Estimate (3% per year)
2020	$666,422
2021	$686,415
2022	$707,007
2023	$728,217
2024	$750,064
2025	$772,566
2030	$895,615

Timeframe:

Priority: 3 (Phase 1), 10 (Phase 2)

MARSH RUN GABION REPLACEMENT – DOWNSTREAM OF WASHINGTON STREET

This project is the removal and replacement of the existing gabion basket streambank stabilization for an estimated length of 180 linear feet. The wire structure of the lower baskets has scoured, failed and no longer adequately supports the upper baskets. The estimated construction cost (2020) is $143,900. Design, permitting, bidding, and contract administration is estimated at $15,900. An additional $1,600 is estimated for easement preparation.

Cost Estimate: (See above)

Timeframe:

Priority: 4

STREAMBANK STABILIZATION - COULTER TO POPLAR AVENUES

This project is the realignment of the stream at Coulter and Poplar Avenues in Indiana Borough

ITEM	QTY	UNIT	UNIT PRICE	ITEM PRICE
Erosion Controls & Bypass Pumping	1	L.S.	$8,000	$8,000
Channel Restoration *	110	L.F.	$350	$38,500
			Subtotal	**$46,500

* This item includes excavation and stabilization of stream bed and slopes

**Based upon a September 13, 2017 estimate. Inflated at 3% per year to 2020, the estimated cost is $50,812.

Cost Estimate:

Year	Cost Estimate (3% per year)
2020	$50,812
2021	$52,336
2022	$53,906
2023	$55,524
2024	$57,189
2025	$58,905
2030	$68,287

Timeframe:

Priority: 5

STREAMBANK STABILIZATION – WILLOW AVENUE TO 7TH STREET

This work is the stabilization of the existing streambank by means of planting an estimated 500 live stakes (with blanket) and the associated bypass pumping.

Cost Estimate: The estimated cost is $19,697 (2020).

Year	Cost Estimate (3% per year)
2020	$19,697
2021	$20,288
2022	$20,896
2023	$21,523
2024	$22,169
2025	$22,834
2030	$26,471

Timeframe:

Priority: 6

MARSH RUN DAYLIGHTING – BURNS TO NIXON AVENUES

In this area, portions of Marsh Run flow through an open channel while other portions are conveyed through a culvert. This culvert extends approximately 200 feet between two homes, under Water Street, and outlets adjacent to North Cherry Avenue. It is undersized and has deteriorated to a point where it could structurally fail in the future. The upstream opening measures 4 feet wide by 3.5 feet high and is located in the backyard of a Water Street residence.

The goal of this project is to "daylight" the portions of stream that currently flow through the culvert and to create a low-lying floodplain adjacent to Marsh Run. This floodplain will provide temporary storage volume for excess stormwater during severe storm events. Property acquisition will be required. There are several structures located in this defined area, as well as several vacant lots. These parcels are owned by different individuals.

This project will include the establishment of a riparian buffer. This buffer will provide many ecological benefits as well as "green" space for use by the public.

No adverse impacts are anticipated as a result of the proposed project. By replacing the enclosed stream with an open channel, the conveyance capacity of the stream will increase at lower flood heights. This is a result of creating an elevated flood plain and riparian buffer during the process of creating the open channel. Out-of-bank flow will be less frequent, at lower elevations, and at reduced magnitudes. In addition, the out-of-bank flow will be better-directed along the channel instead of the current pattern of uncontrolled lateral flow along the adjoining cross streets. These events often cause nearby properties to subsequently be subjected to flooding. These issues will be alleviated by the project.

The existing Water Street culvert should be replaced by an 8-feet wide by 4-feet high concrete box culvert. Construction of a new culvert may require the Borough to purchase and demolish the residence located near the present alignment of the culvert.

Cost Estimate: Acquisition = $500,000; Demolition = $30,000; Engineering/Design/Permitting = $50,000; Construction = $150,000; Total = $730,000 (2020).

Timeframe:

Priority: 7

WILLOW AVENUE / MARSH RUN CULVERT CLEANING

A bridge culvert located at Willow Avenue and Maryland Way is made up of two parallel cells. The upstream end of the westerly cell is partially obstructed. This project would consist of removing the sediment obstruction to make the culvert operate as designed. This will increase the amount of water that is able to be conveyed through the culvert. In addition to sediment removal, some bank stabilization will be required to ensure that no streambank erosion or scour will occur due to re-opening the culvert cell. The project scope would include field survey, the preparation of plans and specifications, permitting, bidding, contract administration / inspection, maintenance of flow and removal of accumulated sediment in the westerly cell of the culvert.

Cost Estimate: $16,500 (Design); $25,000 (Construction); Total = $41,500 (2020).

Timeframe:

Priority: 8

WILLOW AVENUE CHANNEL ALIGNMENT & BANK STABILIZATION

This project is the stabilization of the westerly streambank and a portion of the easterly streambank of Marsh Run, upstream of the existing Willow Avenue twin-cell culvert. This work would likely require the acquisition and removal of an existing dwelling. Re-alignment of the Marsh Run channel, just upstream of the westerly cell, would allow flow to enter the cell cleaned under priority 8, above.

Cost Estimate: $42,200 (Design, permitting, bidding, contract admin.); $210,000 (Right-of-Way & Legal); $124,000 (Construction); Total = $376,200 (2020).

Timeframe:

Priority: 9

SOUTH 15TH STREET CULVERT REPLACEMENT PROJECT

Refer to previous description.

Timeframe:

Priority: 10 (Phase 2), 3 (Phase 1)

5th STREET BRIDGE APPROACH CHANNEL STABILIZATION

The reach of Marsh Run upstream of the Fifth Street bridge is subject to scour and accumulated sediment. The stream channel is shifting to the south, resulting in poor alignment into the Fifth Street bridge opening. Portions of the wall that forms the south bank just upstream of the bridge is being undercut by Marsh Run causing instability. This wall has the potential to collapse, which would threaten the south streambank and eventually the residence located on the overbank. A large sediment deposit has formed in the right side of the channel, restricting the flow into the bridge opening.

As the stream channel approaches the Fifth Street Bridge, the stream alignment should be improved to provide a more efficient flow into the bridges. The streambanks should be stabilized with rock at the entrance to the bridge.

Cost Estimate: $27,300 (Engineering and Permitting); $2,000 (Right-of-Way / Legal); $110,800 (Construction); Total = $140,100 (2020).

Timeframe:

Priority: 11

W. MAPLE STREET TO CARTER AVENUE VEGETATION & SCRAP REMOVAL

Downstream of Maple Street the stream channel is constricted by a combination of thick vegetation and scrap metal on the east side of Marsh Run. This constriction results in increased flooding to buildings on the opposite side of the channel.

Downstream of Maple Street, the stream channel should be cleared of vegetation. The scrap metal encroaching on the stream channel should be removed.

Cost Estimate: $7,000 (Design, Bidding); $5,000 (Right-of-Way / Legal); $23,000 (Construction); Total = $35,000 (2020).

Timeframe:

Priority: 12

N. 4TH STREET CULVERT REPLACEMENT

The reach of Marsh Run from Fourth Street downstream to Oak Avenue has a history of street, yard and basement flooding and areas of streambank erosion. In this reach, an inadequate, 650-foot long culvert passes under Fourth Street and Chestnut Street. In 1994, the Borough constructed an enlarged rock gabion channel between Chestnut Street and Oak Avenue, a distance of 480 feet. This project improved stream capacity in this reach. The existing culvert under Chestnut Street should be replaced with a new 8'-wide by 4'-high concrete box culvert.

Cost Estimate: $311,000 (Engineering and Permitting); $1,800,000 (Construction); Total = $2,111,000 (2020).

Timeframe:

Priority: 13

S. REX AVENUE / GOMPERS AVENUE STORM SEWER

This work is the design and construction of approximately 500 linear feet of storm sewer on the south side of Gompers Avenue (west of S. Rex Avenue) and 200 linear feet of storm sewer on the east side of S. Rex Avenue (north of Gompers).

Cost Estimate: $8,200 (Engineering); $116,000 (Construction); Total = $124,200 (2020).

Timeframe:

Priority: 14

PRIORITY	PROJECT LISTING		PROJECT ITEM / ESTIMATED DESIGN COSTS / DURATION (WKS.)							EST. R/W & LEGAL COSTS	CONST. COST / DURATION (WKS)
PROJECT NO.	PROJECT NAME		SURVEYING	DESIGN	E&S PLAN	E&S PLAN REVIEW &/OR PERMITTING	BIDDING to NTP	RPR / CONST. ADMIN.	TOTALS		
1	Enlarge First Ward Stormwater Detention Facility	1.00	1.01	1.02	1.03	1.04	1.05	1.06		1.07	1.08
1			$7,500	$26,000	$3,500	$7,000	$3,000	$8,000	$55,000	$0	$236,500
	a, d, f		3	7	1	13	10		34		14
2	South 7th Street Storm Sewer Improvements	2.00	2.01	2.02	2.03	2.04	2.05	2.06		2.07	2.08
4			$1,400	$4,500	$1,500	$4,000	$3,000	$1,500	$15,900	$0	$66,656
	b, d, l, m		2	2	1	8	10		23		6
3	South 15th Street Culvert Replacement - Phase 1	3.00	3.01	3.02	3.03	3.04	3.05	3.06		3.07	3.08
9			$7,500	$26,800	$5,000	$15,000	$3,000	$18,500	$75,800	$28,000	$234,926
	c		2	6	2	43	10		63		6
4	Marsh Run Gabion Replacement	4.00	4.01	4.02	4.03	4.04	4.05	4.06		4.07	4.08
14			$1,400	$4,000	$1,500	$4,000	$3,000	$2,000	$15,900	$1,600	$143,900
	b, d, i, k, m		2	2	1	8	10		23		10
5	Streambank Stabilization - Coulter to Poplar Avenues	5.00	5.01	5.02	5.03	5.04	5.05	5.06		5.07	5.08
3			$1,400	$4,000	$1,500	$4,000	$3,000	$2,000	$15,900	$3,000	$50,812
	d, i, k, m		2	2	1	8	10		23		3
6	Streambank Stabilization - Willow Avenue to 7th Street	6.00	6.01	6.02	6.03	6.04	6.05	6.06		6.07	6.08
5			$1,400	$2,500	$1,500	$4,000	$3,000	$1,000	$13,400	$0	$19,697
	b, d, i, k, m		2	2	1	8	10		23		2
7	Marsh Run Daylighting - Burns to Nixon Avenues	7.00	7.01	7.02	7.03	7.04	7.05	7.06		7.07	7.08
6			$7,000	$23,000	$3,000	$6,000	$6,000	$5,000	$50,000	$500,000	$180,000
	a, f, d, g		3	8	2	13	10		36		6
8	Willow Avenue Culvert Cleaning	8.00	8.01	8.02	8.03	8.04	8.05	8.06		8.07	8.08
7			$0	$4,000	$1,500	$6,000	$3,000	$2,000	$16,500	$0	$25,000
	f, k, m		0	3	1	13	10		27		2
9	Willow Avenue Channel Alignment & Bank Stabilization	9.00	9.01	9.02	9.03	9.04	9.05	9.06		9.07	9.08
8			$2,300	$15,200	$6,000	$6,000	$3,000	$9,700	$42,200	$210,000	$124,000
	b, d, i, k, m		3	5	2	13	10		33		6
10	South 15th Street Culvert Replacement - Phase 2	10.00	10.01	10.02	10.03	10.04	10.05	10.06		10.07	10.08
9						$0	$1,000	$22,200	$23,200	$0	$304,496
			0	0	0	0	10		10		7
11	Fifth Street Bridge Approach Channel Stabilization	11.00	11.01	11.02	11.03	11.04	11.05	11.06		11.07	11.08
10			$2,300	$10,000	$3,000	$6,000	$3,000	$3,000	$27,300	$2,000	$110,800
	b, i		3	4	1	13	10		31		4
12	W. Maple St. to Carter Ave. Vegetation & Scrap Removal	12.00	12.01	12.02	12.03	12.04	12.05	12.06		12.07	12.08
11				$2,000	$1,000		$3,000	$1,000	$7,000	$5,000	$23,000
	b			3	1		10		14		6
13	North 4th Street Culvert Replacement	13.00	13.01	13.02	13.03	13.04	13.05	13.06		13.07	13.08
12			$15,000	$172,000	$3,000	$30,000	$15,000	$76,000	$311,000	$0	$1,800,000
	c, n, o		3	39	2	36	15		95		40
14	S. Rex Avenue / Gompers Avenue Storm Sewer	14.00	14.01	14.02	14.03	14.04	14.05	14.06		14.07	14.08
13			$700	$2,500	$1,000		$3,000	$1,000	$8,200	$0	$116,000
	e		2	2	1	0	10		15		3

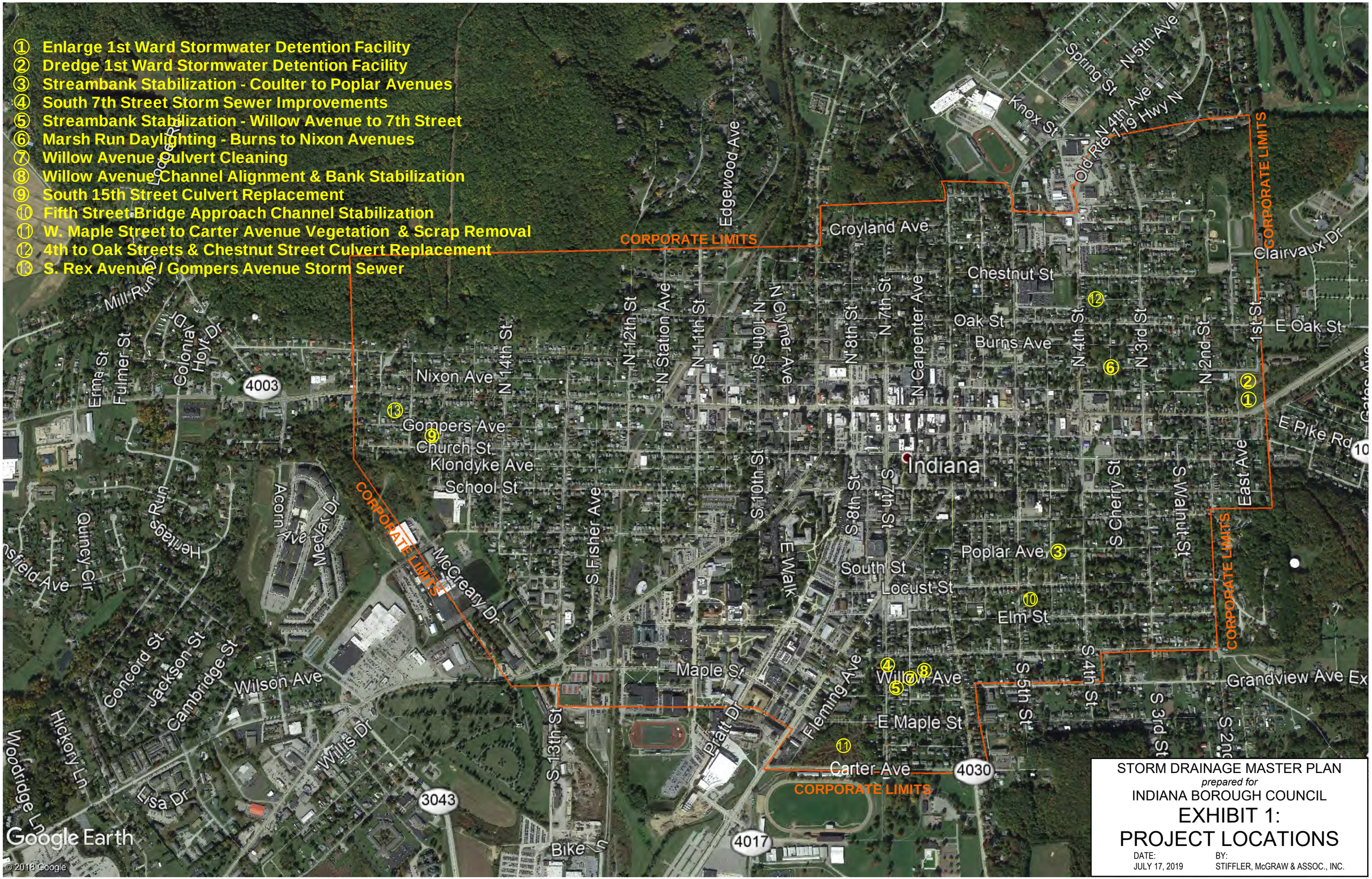
NOTES:

No contingency is included in design or construction costs shown above.
Minimum duration on survey is 2 weeks to allow for PA One-Call.
60 days / 8 weeks (min.) assumed for NPDES and General Permits.

	Indicates input value - value is used in computations
	Indicates computed value.
	Indicates Borough-assigned Project Number
	CDBG-funded projects

a Assumes boundary survey
b Assumes less than 1-ac. Disturbance (No NPDES Permit), E & S Plan to be approved by County Conservation District.
c Joint Permit Application required (Chapter 105, 106 Permit (DEP), Chapter 404 Permit (USACOE)
d Part-time Inspection with minor Construction Administration.
e E & S provisions shown on plan, effort included in design. No Permit anticipated.
f GP-11 General Permit anticipated.
g Construction cost includes $30,000 for demolition.
h PennDOT Highway Occupancy Permit anticipated.
i GP-3 General Permit anticipated.
j No channel work anticipated.
k Construction easement to be obtained.
l GP-4 (Outfall) General Permit anticipated.
m Design, surveying, and permitting costs assume that effort is combined with other projects.
n Includes $100k for Geotechnical Investigation & test borings in design fee.
o Likely a PennDOT Project.

Revised 07-23-2020
Revised 01-21-2020



STORM DRAINAGE MASTER PLAN

prepared for

INDIANA BOROUGH COUNCIL

EXHIBIT 1: PROJECT LOCATIONS

DATE: JULY 17, 2019

BY: STIFFLER, McGRAW & ASSOC., INC.