

Rehder & Associates, Inc.

Civil Engineers, Planners & Land Surveyors

May 21, 2012

To: City of St. Paul Staff

Re: Cossetta's Restaurant Storm Water Management

The purpose of this letter/memo is to summarize the sequence of events that led to the design of the storm water management system currently proposed for the Cossetta Restaurant site. It will also explain how the discovery of existing bedrock conditions have made the currently approved plan undesirable due to failure risks and, finally, it will summarize how the proposed plan (even without the inclusion of a potentially damaging rate control device) provides improved rates, volumes and treatment over the existing conditions.

As part of the overall site development plan, Rehder and Associated, Inc needed to design a storm water management system to meet the City's rate control and sustainability requirements. The rate control requirement was triggered by the fact that the site exceeded 0.25-acres of disturbed area. The volume and treatment requirements (part of the sustainability goals), were part of the TIF agreement.

The site presented Rehder with a unique combination of characteristics that make storm water management challenging. Both parts of the site are generally steep sloping and are each directed toward the existing building and addition. There is also the presence of shallow bedrock, which severely limits the ability to infiltrate storm water runoff (regardless of the method) and makes underground storm water detention much more difficult. These site characteristics led us to what we believed was the most viable solution: the use of an underground detention system with the system located near the base of the sloped lot. The fact that we would not be allowed to place the system in the public alley right-of-way forced us to move the underground system even closer to the building/addition than would otherwise be desirable. In addition to the underground detention system, the proposed plan also provides storm water treatment through the use of a specialized water treatment structure and volume reduction by reducing the imperviousness of the overall site.

Only during construction, when fissures were discovered in the bedrock, did it become clear that the most viable rate control solution would pose significant risks to the lower level of the proposed addition if the system were installed and it were to fail. Rehder and Associates, Inc. requested the opinion of Dan Vruno, P.E. with American Engineering Testing (AET), Inc. to review the soils/bedrock and provide a recommendation regarding the risks associated with the proposed underground detention system given the presence of the newly discovered fissured bedrock. AET recommended that, given the fissures in the bedrock, that the system not be installed as proposed.

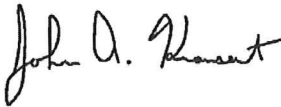
Given the site conditions, Cossetta's is seeking a variance solely from the rate control requirement. However, Cossetta's will comply with all other requirements including water quality and Best Management Practices.

Supporting documentation for the variance request is the fact that the site is incorporating Best Management Practices (BMPs) to improve water quality and slightly reduce the rate and volume of runoff compared to the existing conditions. One type of BMP is to reduce the amount of impervious surface in the post construction conditions, compared to the existing conditions. In this case, both parts of the site will have reduced impervious surfaces in the post construction condition. This will result in slightly reduced rates and volumes off of each site, compared to the existing conditions (see attached Rate and Volume Control Summary).

In addition, approximately 8,000 square feet of what was existing parking lot is now being converted to roof top area with the construction of the new addition. Runoff from the proposed roof will be cleaner compared to the sediment and oils that come off a parking lot during a rain event. The second type of BMP being utilized is the construction of a water quality structure (EcoStorm Manhole). The EcoStorm Manhole is capable of removing the required 80% total suspended solids and 60% phosphorous for a 2-yr, 24-hr design storm event (see attached brochure). The EcoStorm Manhole will provide treatment for both the Smith Avenue Lot and the West 7th Street Lot and will be sized accordingly given the removal of the underground detention system. In addition, the EcoStorm Manhole will also receive runoff from Maharajah's site to the northeast and the apartment site to the northwest. This will be additional runoff that was untreated in the existing conditions but now being treated by the proposed EcoStorm Manhole.

Please give me a call if you would like to discuss this project further.

Sincerely,



John A. Krausert, P.E.

RATE & VOLUME CONTROL SUMMARY

SMITH AVENUE LOT

	RATE CONTROL		VOLUME CONTROL	
	EXISTING	PROPOSED	EXISTING	PROPOSED
STORM EVENT	CFS	CFS	AC-FT	AC-FT
100-YR	3.70	3.68	0.237	0.232

WEST 7TH STREET LOT

	RATE CONTROL		VOLUME CONTROL	
	EXISTING	PROPOSED	EXISTING	PROPOSED
STORM EVENT	CFS	CFS	CFS	CFS
100-YR	4.47	4.45	0.286	0.280



Existing (Smith Lot)



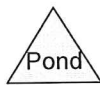
Existing (West 7th Lot)



Proposed (Smith Lot)



Proposed (West 7th Lot)



1973012_Cossetta's

Type II 24-hr 100-yr Rainfall=5.90"

Prepared by {enter your company name here}

Printed 5/21/2012

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Time span=0.00-48.00 hrs, dt=0.03 hrs, 1601 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Existing (Smith Lot)	Runoff Area=21,835 sf 97.76% Impervious Runoff Depth=5.66" Tc=10.0 min CN=98 Runoff=3.70 cfs 0.237 af
Subcatchment 2: Proposed (Smith Lot)	Runoff Area=21,835 sf 91.76% Impervious Runoff Depth=5.54" Tc=10.0 min CN=97 Runoff=3.68 cfs 0.232 af
Subcatchment 3: Existing (West 7th Lot)	Runoff Area=26,380 sf 97.42% Impervious Runoff Depth=5.66" Tc=10.0 min CN=98 Runoff=4.47 cfs 0.286 af
Subcatchment 4: Proposed (West 7th Lot)	Runoff Area=26,380 sf 95.77% Impervious Runoff Depth=5.54" Tc=10.0 min CN=97 Runoff=4.45 cfs 0.280 af

1973012_Cossetta's

Prepared by {enter your company name here}

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Type II 24-hr 100-yr Rainfall=5.90"

Printed 5/21/2012

Summary for Subcatchment 1: Existing (Smith Lot)

Runoff = 3.70 cfs @ 12.01 hrs, Volume= 0.237 af, Depth= 5.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type II 24-hr 100-yr Rainfall=5.90"

	Area (sf)	CN	Description
*	21,345	98	Impervious
*	490	80	Pervious
	21,835	98	Weighted Average
	490		Pervious Area
	21,345		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment 2: Proposed (Smith Lot)

Runoff = 3.68 cfs @ 12.01 hrs, Volume= 0.232 af, Depth= 5.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type II 24-hr 100-yr Rainfall=5.90"

	Area (sf)	CN	Description
*	20,035	98	Impervious
*	1,800	80	Pervious
	21,835	97	Weighted Average
	1,800		Pervious Area
	20,035		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment 3: Existing (West 7th Lot)

Runoff = 4.47 cfs @ 12.01 hrs, Volume= 0.286 af, Depth= 5.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type II 24-hr 100-yr Rainfall=5.90"

	Area (sf)	CN	Description
*	25,700	98	Impervious
*	680	80	Pervious
	26,380	98	Weighted Average
	680		Pervious Area
	25,700		Impervious Area

1973012_Cossetta's

Type II 24-hr 100-yr Rainfall=5.90"

Prepared by {enter your company name here}

Printed 5/21/2012

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Summary for Subcatchment 4: Proposed (West 7th Lot)

Runoff = 4.45 cfs @ 12.01 hrs, Volume= 0.280 af, Depth= 5.54"

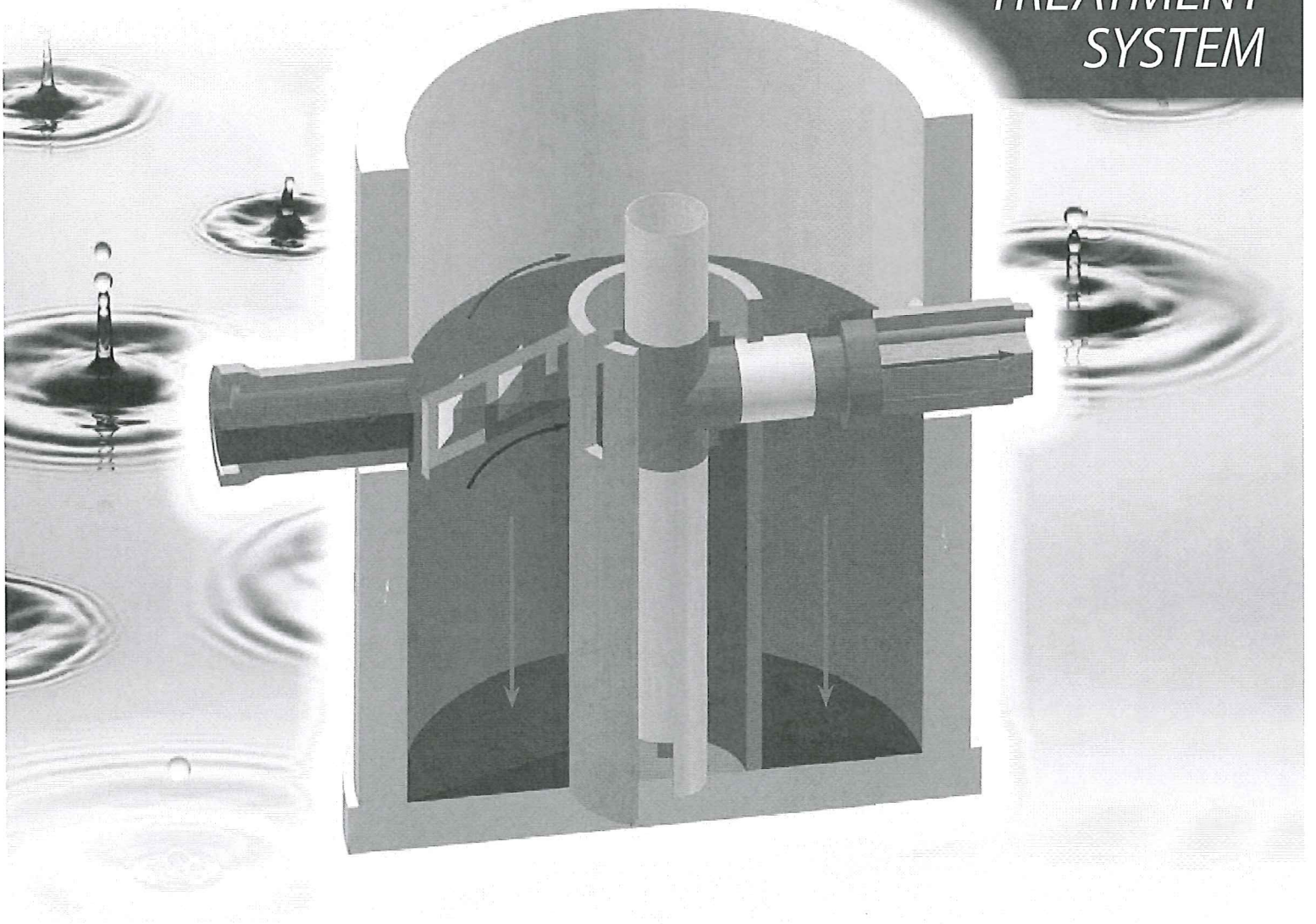
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.03 hrs
Type II 24-hr 100-yr Rainfall=5.90"

	Area (sf)	CN	Description
*	25,265	98	Impervious
*	1,115	80	Pervious
	26,380	97	Weighted Average
	1,115		Pervious Area
	25,265		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

ecoStorm[®]

HYDRODYNAMIC
TREATMENT
SYSTEM

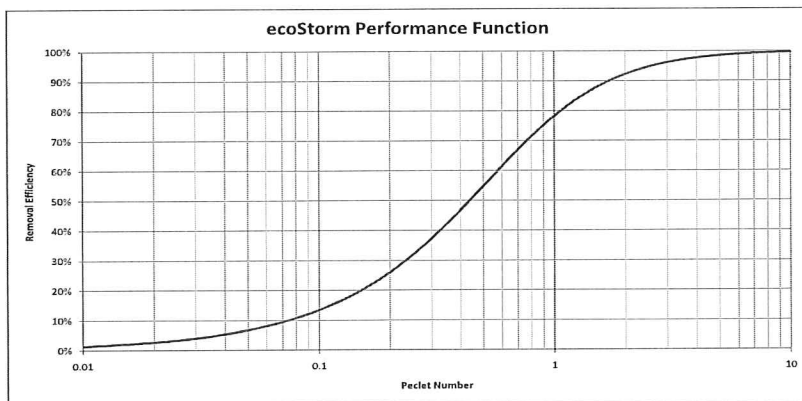


protect **TODAY** by
building for **TOMORROW**


ENVIRONMENTAL SYSTEMS, Inc.
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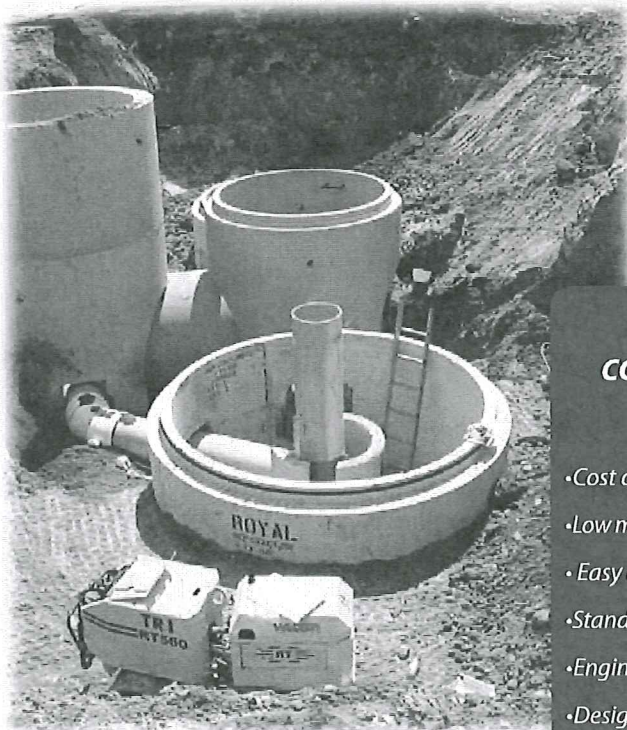
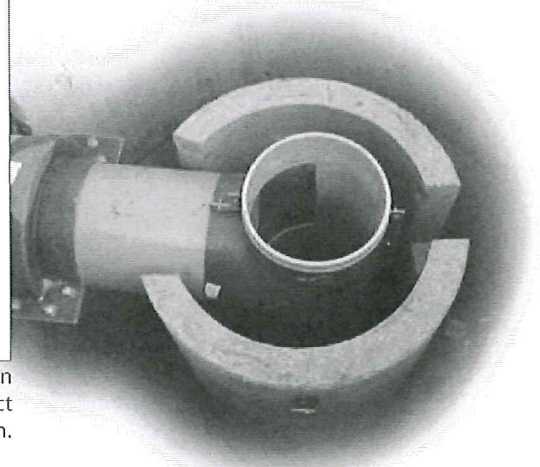
ecoStorm[®]

ecoStorm[®] is an affordable solution for managing non-point source pollutants in stormwater.



Design based on third party full scale laboratory testing utilizing Peclet normalization theory. Through this normalization, we can scale these results to accurately predict project specific performance for all ecoStorm[®] sizes with any particle size distribution.

Internal components allow for almost any inlet and outlet pipe materials.



ecoStorm[®] design allows for tight angles between the inlet and outlet pipe. This is especially beneficial for minimizing the footprint in offline systems.

ecoStorm[®] is ideal for new construction or retrofit applications including:

Parking Lots • Industrial Manufacturing Facilities
Commercial Developments • Transportation/Maintenance Facilities
Municipal/Residential Drainage Improvements

ecoStorm[®]—The most cost effective BMP for meeting stormwater regulatory requirements

- *Cost competitive—single structure design reduces footprint and excavation costs*
- *Low maintenance costs—quick and easy access for inspection and contaminant removal*
- *Easy installation—encompassed design easily assembled on construction site*
- *Standard precast units with capacity to manage typical treatment flows*
- *Engineered solution—individual units are custom designed for each specific project*
- *Design flexibility, allowing for variability of removal efficiency (typically 80%), particle size distribution, flows, and annualized or event based designs*
- *Ideal for new construction or retrofit applications*

ecoStorm® Phase Operation

Dry Weather Level

ecoStorm® utilizes two concentric circular structures of varying diameters (D1 & D2). Water levels within the inner and outer cylinders are equalized through a vertical weir opening. The outer cylinder separates contaminated particulate from the influent.

A deflection plate promotes a swirling motion in the structure, increasing the travel path of pollutants between the inlet and outlet, thereby providing more time for gravity separation of settleable solids.

Floating pollutants such as petroleum and litter are retained in the structure via the skimming outlet pipe.

Routine Storm Event

Rainfall generates enough energy to transport non-point source pollutants to storm drain inlets where they are then delivered to the inlet of the ecoStorm®. A properly sized-system will, on average, introduce stormwater at a flow rate that allows ample detention time to achieve separation of both floating and settling contaminants.

Intensifying Storm Event

As rainfall intensity increases, the increased energy allows stormwater runoff to transport larger, heavier materials having settling velocities which allow separation time to decrease as flow rate increases.

Typically any smaller and lighter floating pollutants and debris were conveyed during previous routine storm flow. The captured floating pollutants and debris rise with the internal liquid level.

Design Storm Event

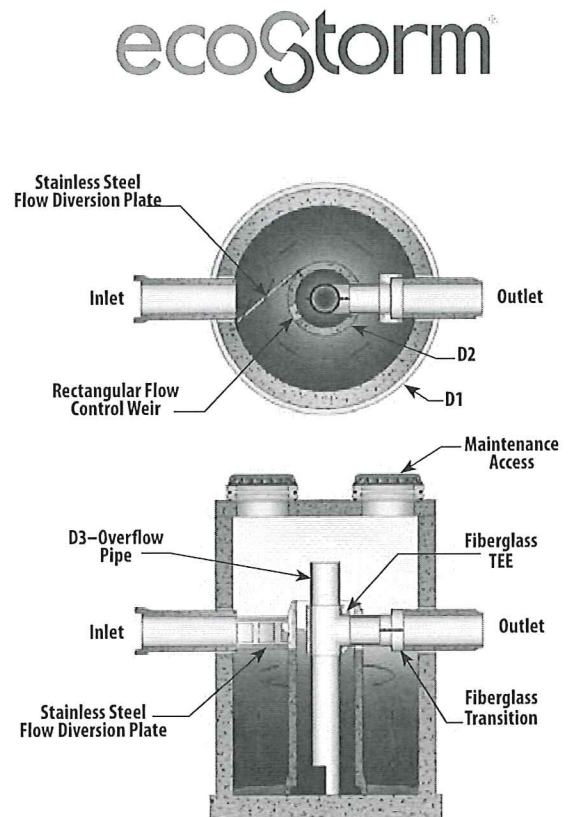
The "design storm" is a rainfall event that when achieved, has already flushed or delivered the pollutant load to the ecoStorm®. Therefore the majority of target pollutants have already been separated and are retained in the structure. Rainwater through the apparatus now carries little or no target pollutants.

Peak Storm Event

Peak storms deliver the maximum flow rate or stormwater volume for which each system has been hydraulically calibrated to handle. Individual project site and hydraulic sizing allow for an accurate prediction of maximum liquid levels within the system. Target pollutants separated at lower storm flows are maintained within the system. Internal flow controls and flow patterns prevent pollutant re-suspension and discharge.

Dry Weather Pump-Out

Pump-out frequency is based on site loading and periodic monitoring of captured pollutant levels in the easily accessed storage chambers.



Site-specific engineering maximizes ecoStorm's treatment of non-point source pollutants. Our design engineers are available to offer free technical support to solve your stormwater management concerns.

www.royalenterprises.net

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"Innovative technological products revolutionizing stormwater pollution control"

Royal Concrete Pipe, Inc.

"Providing quality concrete products since 1990"

Royal Erosion Control Systems, LLC

"Concrete block mat system for the prevention of soil erosion"



ecoStorm

Gravity separation stormwater treatment system



ecoStorm^{plus}

ecoStorm treatment **plus** filtration of smaller particles, dissolved nutrients and heavy metals



ecoStop

Catastrophic hydrocarbon spill control system



ecoSep

Below-grade, high efficiency oil/water separators



ecoLine^b

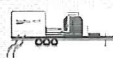


ecoTop

Above-grade, high efficiency oil/water separators



ecoLine^a



RoadSide ACISTTM

Portable stormwater treatment system for turbidity and pH management



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Underground stormwater detention & infiltration system



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