NOWRA

To strengthen and promote the decentralized wastewater industry.

Brief History of Drip

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To strengthen and promote the decentralized wastewater industry.

Presented By:

James Prochaska, MS-PE

JNM Technologies Inc.

Steven Berkowitz

NCDHHS (Retired); SERCAP

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The Early Years

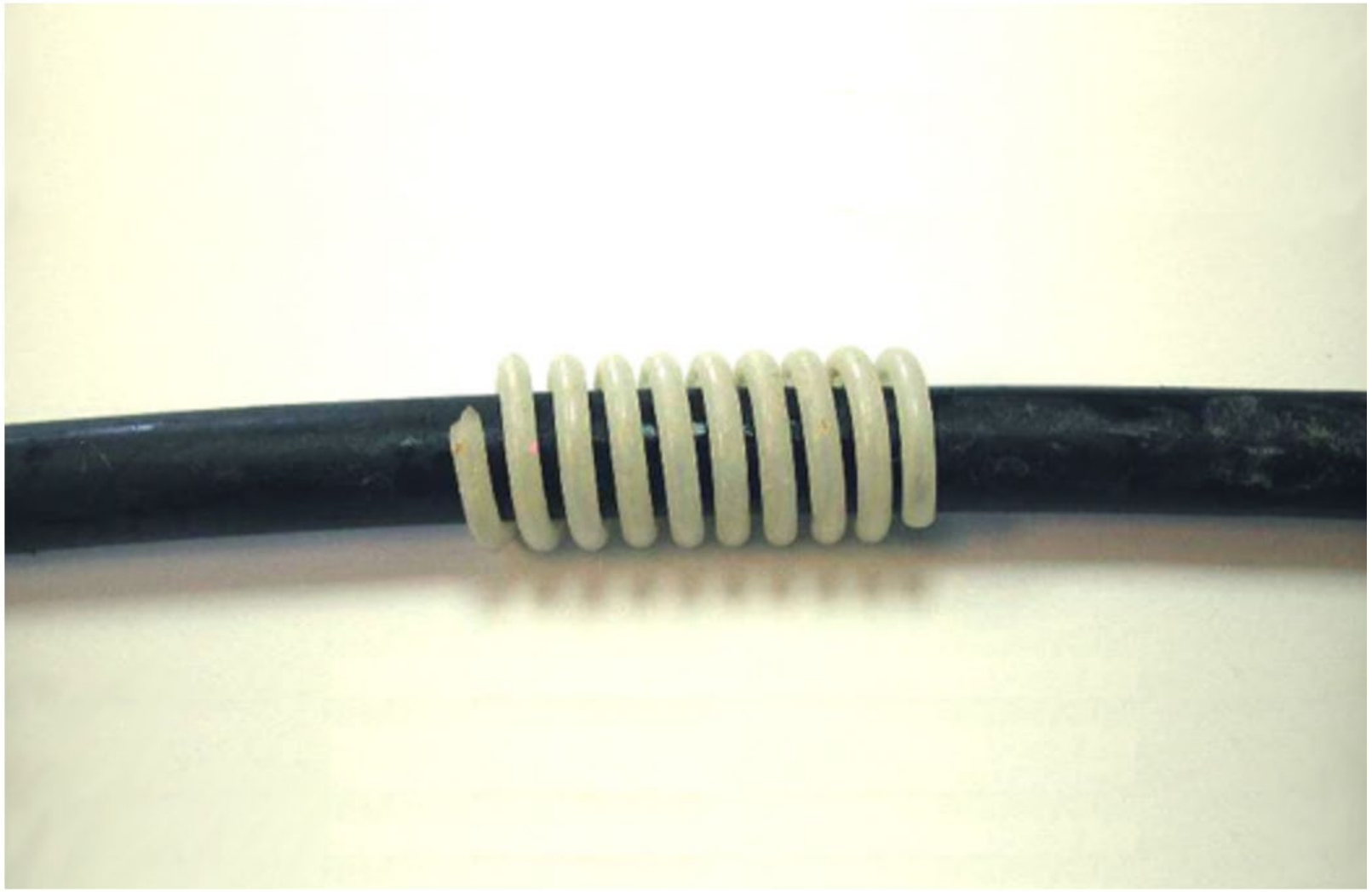
The Advent of Modern Drip Irrigation

A Thirsty Country Waiting to Be Reborn

By - אין מידעThe Palmach Archive via the PikiWiki

Born November 27, 1897 in Poland, Simcha Blass studied engineering before co-founding Mekorot, Israel's national water company, which provided water for Israel's southern Negev desert in the 1930's.

By - אין מידעThe Palmach Archive via the PikiWiki



Original production, inline laminar flow emitter using capillary micro-tube.

NETAFIM LEGACY

1965

NETAFIM, BLASS SIGN AGREEMENT TO PRODUCE 1ST COMMERCIAL DRIPPER

Engineer and inventor Simcha Blass carries out tests on the world's first dripper device from the early-to-mid 1960s.

1966

NETAFIM INTRODUCES WORLD'S FIRST DRIPPER

Netafim develops the world's first dripper – an in-line laminar dripper.

1970

TURBULENT WATER PASSAGE RESOLVES CLOGGING PROBLEMS

To resolve the in-line laminar dripper's clogging problems, Netafim acquires the rights to the turbulent water passage patent registered by Hydroplan Ltd.

RAFI MEHOUDAR BEGINS HISTORY WITH NETAFIM IN 1972

- Entrepreneur and Hydraulic Expert. Owner of Hydroplan.
- Approached by Netafim in 1972 to create several new lines of emitters.
- Had 9 of 10 completed in 6 months.
- Holds 400 patents.
- Developed both the RAM and UniRam PC Emitters.

1975

FIRST DRIP IRRIGATION OF COTTON

Netafim drip solutions used for first time to grow cotton.

Crossing the Pond

Drip Comes to the US

Howard Wuertz
Cotton Irrigation-US
Sundance Farm, AZ

- One of the First to Embrace Drip in the US.
- Saw Drip's Advantages and Greater Yields.
- Saw the Problems of Recovering Tubing Year after Year. He began experimenting with subsurface drip irrigation (SDI).
- Became a Pioneer and Inventor in SDI. In 1980 he began converting many of his farms.
- It Would be 10 Years Before Onsite WW Would Move to SDI.

By: Cary Blake/Farm Progress/InformaMarkets/10/31/2017

Sundance Farms SDI

- Drip Tubing Needed to Stay in the Field and not be Recovered Annually.
- Agricultural Practices had to be Modified.
- Use of Thin Wall Drip Tape Evolved.
- Many of the New Cultivation Practices Revolving around SDI were Patented.

By: Cary Blake/Farm Progress/InformaMarkets/10/31/2017

More Drip Emitters

Drip Irrigation Moves from Agriculture to Specialized Applications

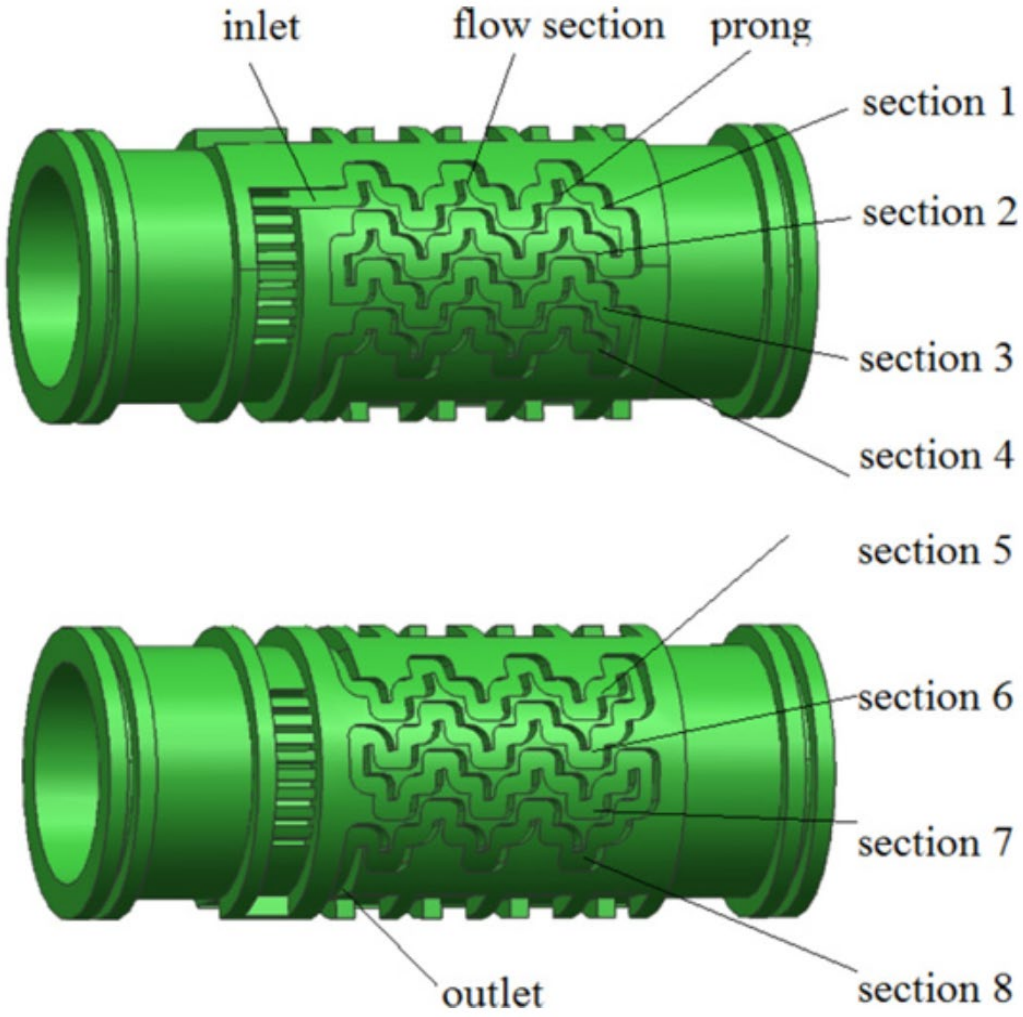


Fig. 1. The structure of the irrigation emitter.

Round Turbulent Flow Emitter Developed 1970's

Original Designers
David and Johnny Miller
Drip'N Tubing

Simulation of the flow characteristics of a drip irrigation emitter with large eddy methods
Elsevier: Volume 58, Issues 3-4, August 2013, Pages 497-506.

1982

NETAFIM INTRODUCES RAM, WORLD'S FIRST INTEGRAL PC DRIPPER

Recognizing the potential of reusable drippers and easy-to-rewind dripperlines for open-field irrigation, Netafim develops the RAM multi-seasonal dripper.

2001

NETAFIM INTRODUCES UNIRAM™ INTEGRAL PC DRIPPER

Netafim develops UniRam, the first generation of drippers for hard water, thereby providing significant advantages for orchard and greenhouse irrigation.

What About Onsite Drip Dispersal of Treated Wastewater?

Agriculture Has Used Minimally Treated Wastewater in Irrigation Including Drip for Years.

but,

What Are the Effects of Biologically Active Wastewater on Drip Equipment?

1985

NETAFIM ADDRESSES WASTEWATER CHALLENGES

Recognizing the adverse effects of treated wastewater on drip irrigation, Netafim introduces a range of wastewater solutions.

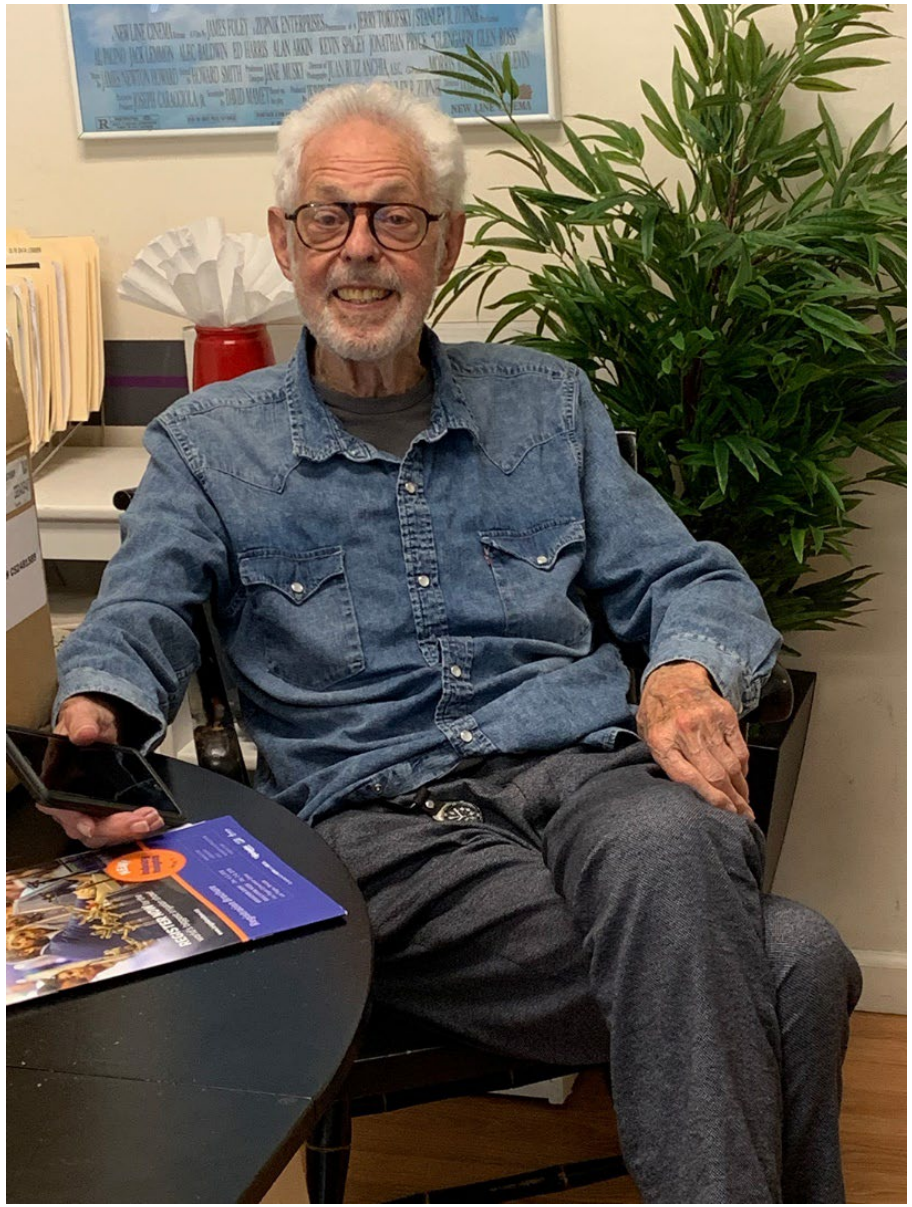
Geoflow

- Root Intrusion research by Battelle is successful in 1978 using trifluralin in plastic polymers – Rootguard.
- 1982 Battelle makes a joint agreement with Rodney Ruskin to develop SDI tubing using Rootguard.
- By 1985 product was developed using round turbulent flow emitters with Rootguard in the emitters.
- In November 1990, EPA gives OK to using Rootguard in irrigation of food and non-food crops.
- 1990 Geoflow is founded by Rodney Ruskin, Karen Ferguson and Alvaro Sanjines.
- The rest is history as they say.

www.geoflow.com/about-us/history

Geoflow

Rodney Ruskin



www.geoflow.com/about-us/history

What is the Status of Drip In the Early 80's?

Answer: **Big Agriculture**

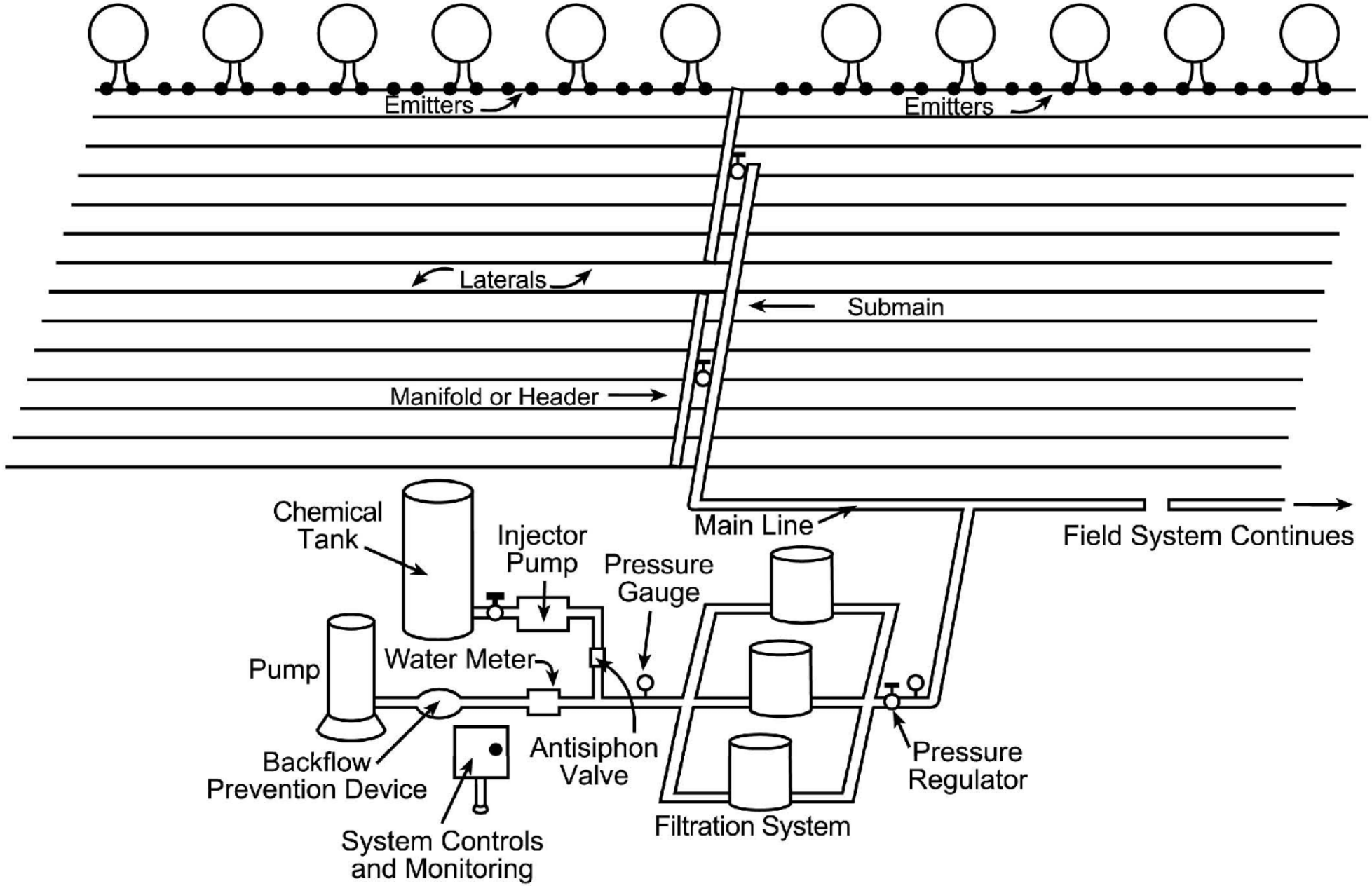


Figure 1.7. An example of a basic microirrigation system. Courtesy of Kansas State University.

Large Scale Agricultural Drip

Big Plows

For Agriculture

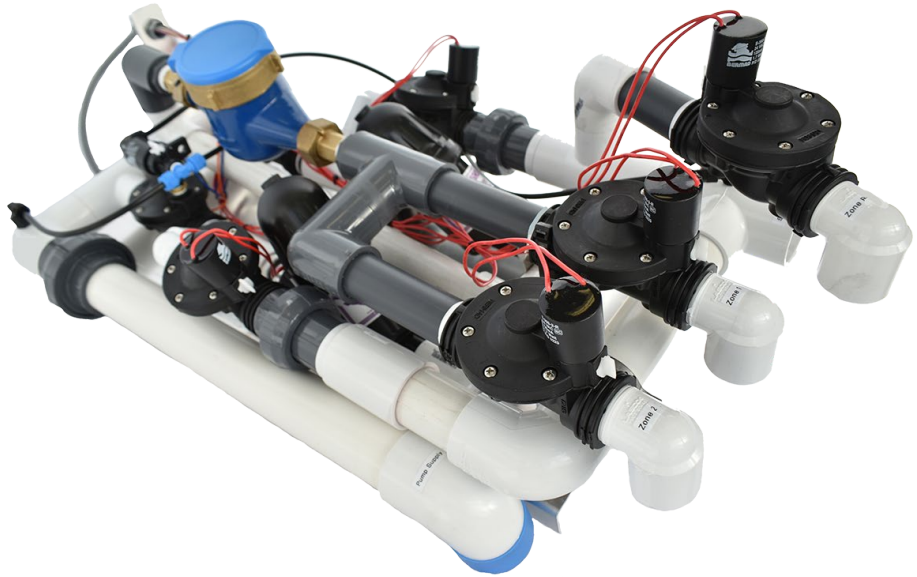
How Can Drip Be Applied To Onsite Systems?

Answer:

Downsize to Meet Onsite's Needs

Smaller Machines

For Onsite Installations



- In 1988 Thomas Sinclair with ADWS encounters a wastewater dispersal situation that could not be solved conventionally.
- Sinclair develops a unique onsite solution using technology found in agriculture. Problem: Had to be sized for onsite and not agriculture.
- Sinclair worked with Netafim to find alternative, smaller components to marry to the pressure compensating RAM drip tubing. In 1989 a “novel” SDI solution for onsite wastewater was installed.
- Wastewater Solutions Inc. was formed on December 7, 1989. On March 14, 1991, Perc-Rite started and was accepted by the State of Georgia.
- This began Perc-Rite’s rapid expansion into the states north and west to Texas.

ONSITE SDI INTEGRATORS

WWS

JNM TECHNOLOGIES, INC.
WATER RESOURCE SOLUTIONS

AMERICAN
Manufacturing Company, Inc.

Geoflow

OVER TIME-MOST ATU MANUFACTURERS

Orenco SYSTEMS

hydro-action
green from the ground up

CLEARSTREAM
WASTEWATER SYSTEMS, INC.

Ecological Tanks, Inc.

norweco

WHITEWATER
DF-Series

HOOT SYSTEMS, LLC
Install A Hoot Don't Pollute

INFILTRATOR
water technologies

Aeris Aerobics
Septics for a Greener Tomorrow

AK

TUFF TIGER

Jet

Pro Flo

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90’s and Beyond

Onsite Use of SDI Is Legitimized

Case Study: Evolution of Drip in North Carolina

1990s

- Schools Seek Pressure Dispersal Alternative to LPP
- Meet John and Tom Sinclair (Waste Water Systems, Inc. Lilburn, Georgia).
- Visit Jackson County High School, Georgia
- Innovative Approval to WWS/Perc-Rite, 1st Approval Edward Best Elementary
- Experimental Approval WWS/NCSU Anaerobic Drip: Lake Wheeler MHP

Trip to Israel, Spring 1994

- Meet Gideon Oron (Ben Gurion University of the Negev)
- Visit Kibbutzim Hetzarim (Netafim); Beit Zera (Arkal); Dorot

Development of DRIPNET

- Computer Program Supporting Hydraulic Analysis and Performance Verification
- Talk to Seventh International ASAE Symposium, Atlanta, Dec. 1994.

Jackson County High School, Georgia

Trip to Israel, Spring 1994

Visit with Dr. Gideon Oron
Ben-Gurion University of the Negev

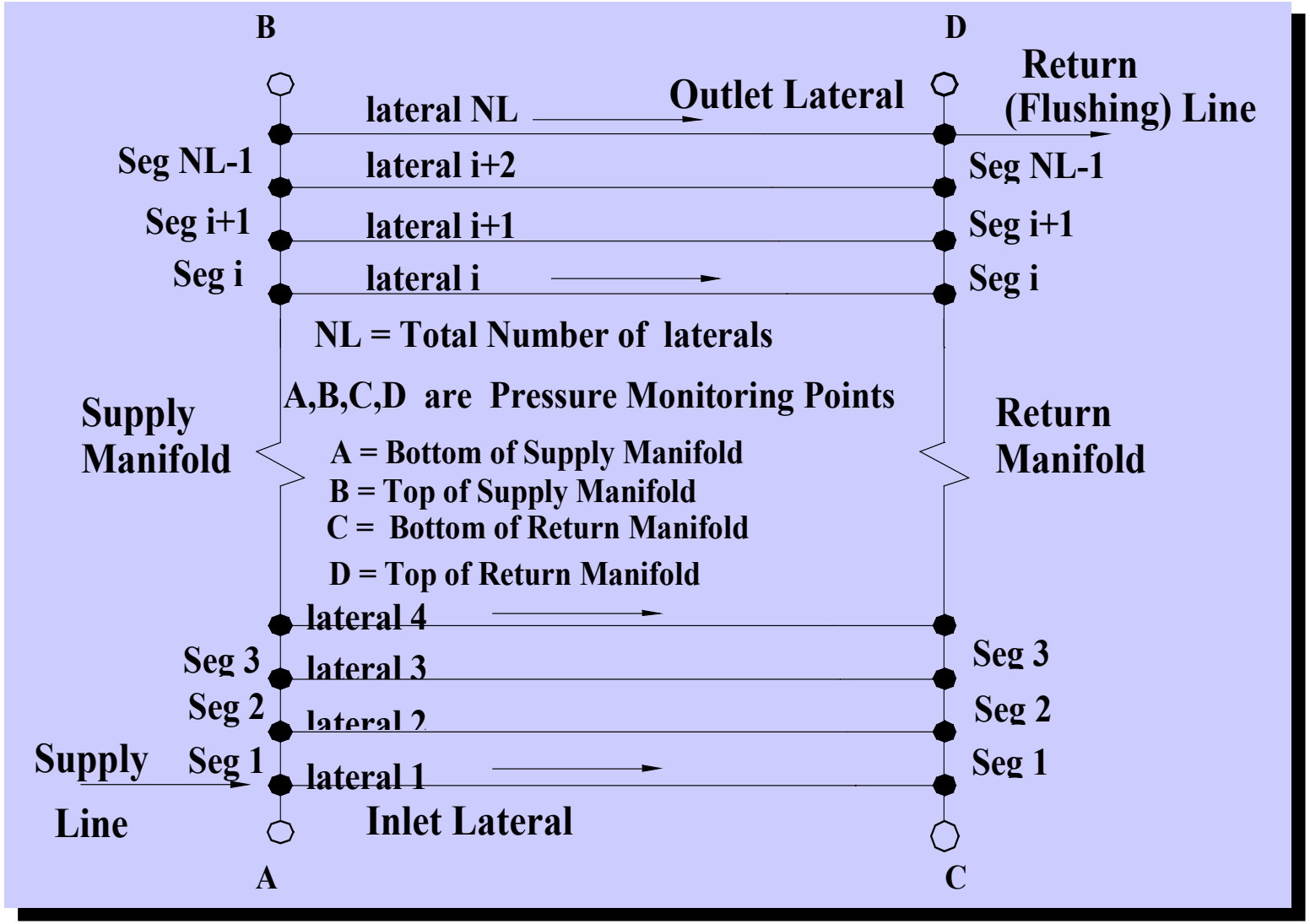
Kibbutzim Visits: Drip Component Manufacturers

Kibbutz Hatzerim: Netafim Tubing

Arkal Filters

Dorot Valve Manufacturer

Computer Program DRIPNET

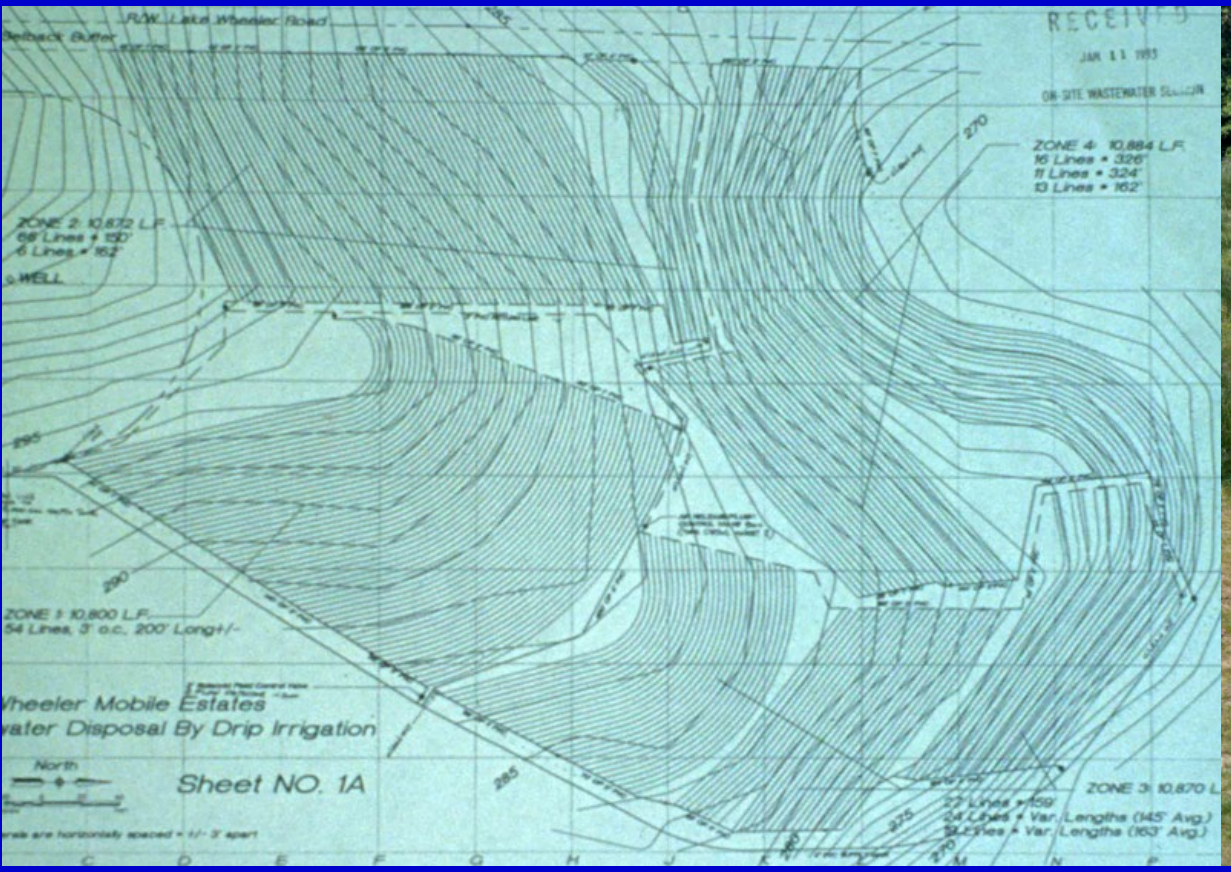


Field Pipe Network Schematic for Simulating System Hydraulic Analysis By DRIPNET to Aid Drip System Design Performance Verification

First Aerobic Drip, Edward Best Elemenaty

- 6000 GPD System
- ST, Recirc Sand Filter Pretreatment
- 37,600 linear feet of drip tubing (3 zones)
- Installed in less than 3-weeks!

First Anaerobic Drip: Lake Wheeler MHP



- 13000 GPD System for 67 Mobile Homes
- 43,400 linear feet of drip tubing (4 zones)

Further Evolution of Drip in NC

2000s

- Geoflow Innovative Approval
- Perc-Rite Approvals to American Manufacturing, Virginia
- Long-Term System Performance Evaluation (presented at ASAE, 2001, Atlanta)
- Top-Feed Manifold becomes SOP for Sloping Lots
- Surface Drip Alternative

Recent

- Liberalization of Siting/Sizing Criteria
- Incorporation into Generic Drip Rules (Effective Jan.1, 2024)
- Conjunctive Use Systems
- Benefits for N-reduction Increasingly Driving Factor

Top-Feed Manifolds, SOP for Sloping Lots

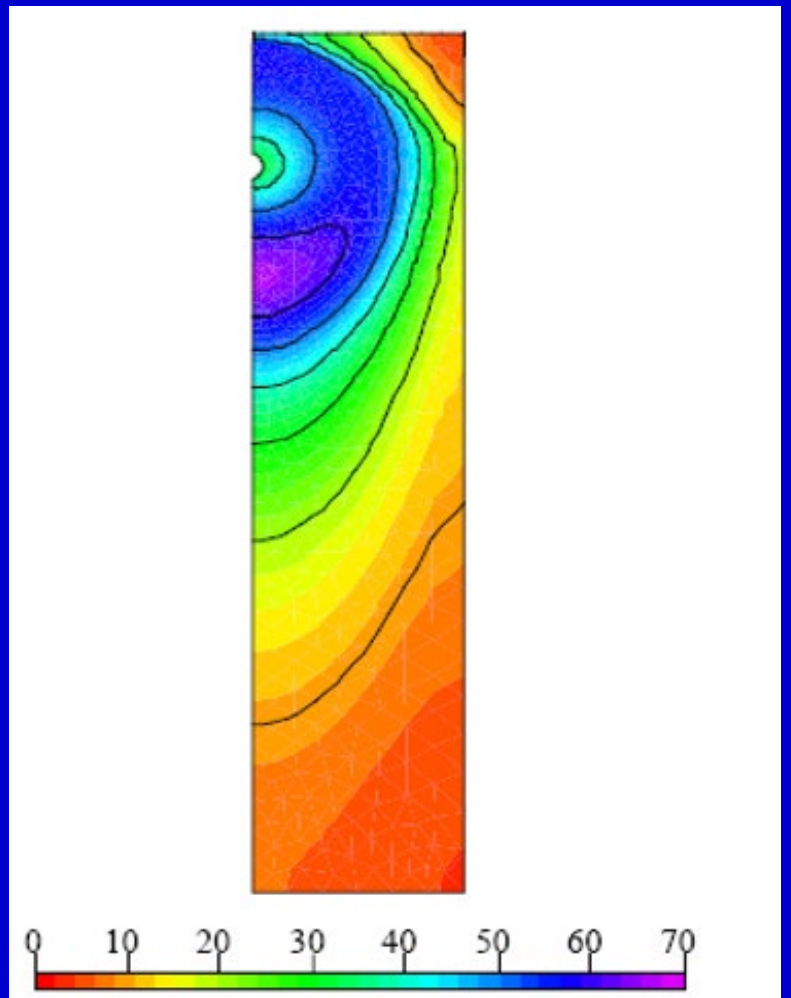
Surface Drip Alternative

Recently Recognized Attributes

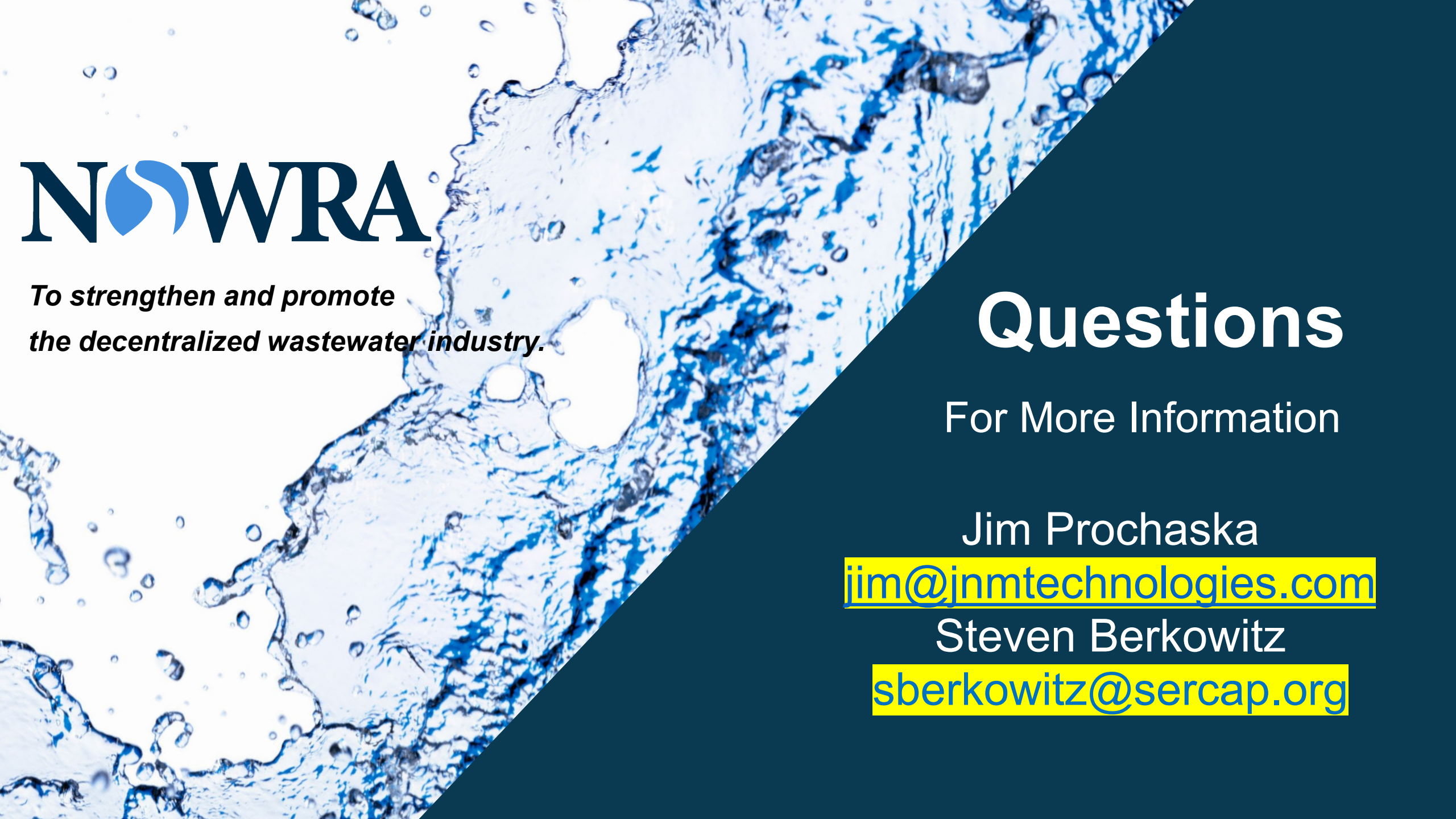
Conjunctive Use

Purple Drip Wastewater Lines on Portion of Soccer Sports Field

Nitrogen Attenuation



. Nitrate-N solute concentration distributions



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Questions

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