Guidelines for Assessing the Flushability of Disposable Nonwoven Products

A Process for Assessing the Compatibility of Disposable Nonwoven Products with Plumbing and Wastewater Infrastructure

Edition 4
May 2018

Preface

Edition 4 of the Guidelines for Assessing the Flushability of Disposable Nonwoven Products (GD4) brings together enhancements to both the Labeling Code of Practice (COP) and the Flushability Assessment test methods.

In conjunction with the COP, GD4 is a powerful, practical, science-based framework for assessing flushability. GD4 is grounded in the Technical Workgroup (TWG) findings from 2014, significant research and testing carried out by INDA members independently, and system collection studies carried out by, and in collaboration with, Wastewater professionals from around the globe. Implementation of this framework will enable companies to provide consistent and clear labeling of non-flushable wipes neither designed nor intended to be disposed via flushing, which has become an unnecessary burden of solid waste being disposed via the toilet on wastewater infrastructure. GD4 will also ensure the continued compatibility of wipes labeled as "Flushable" with wastewater infrastructure.

The structure and approach to both the Flushability Assessment and Code of Practice remain the same as used in Edition 3 of the Guidelines[1] for Assessing the Flushability of Disposable Nonwoven Products (GD3).

Published in 2013, GD3 was the result of nine years of collaborative study by Industry members, with input from representatives of the Wastewater industry from around the world. Incorporating learnings from extensive laboratory and field-testing, GD3 reflected:

- A better understanding of the underlying causes and the extent of problems associated with non-flushable products being inappropriately disposed via the toilet;
- An evolution of the flushability assessment protocol to provide an enhanced testing regime addressing concerns raised by certain Wastewater representatives; and
- Creation of more specific labeling recommendations for non-flushable products for clear and consistent labeling with a "Do Not Flush" symbol.

Ongoing laboratory, field-testing and collection studies continue to demonstrate the effectiveness of GD3, and the compatibility of GD3-compliant wipes with wastewater infrastructure. Based on the data generated in the US and UK, non-flushable products are the predominant materials identified in clogs and at treatment facilities. As such, GD4 and the Code of Practice represent a new opportunity to address the prevalence of non-flushable wipes through more prominent "Do Not Flush" labeling, and continued compatibility with infrastructure of wipes that pass the flushability assessment.

As with all prior editions, GD4 is a living document that reflects developments in related environmental science as well as laboratory and field data from objective sources, including both wastewater and industry groups, to update key test methods and criteria to ensure compatibility of wipes marketed as "Flushable" with wastewater infrastructure.

INDA and EDANA acknowledge, and are grateful for, the invaluable input of all member and nonmember companies, as well as Wastewater stakeholders in North America and Europe who have been involved in the dialogue that shaped these new editions of the Guideline and Code of Practice.

1 Copies available at www.edana.org/industry-initiatives/flushability ; www.inda.org/issues-advocacy/flushability

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1. Summary of key changes in Edition 4

The structure and approach to both the Flushability Assessment and Code of Practice in this edition remain the same as used in GD3.

Prior to starting work together on GD4, INDA members and Wastewater agencies from the US and Canada formed a Technical Work Group (TWG) in 2014 and undertook a comprehensive six-month review of GD3, which upon completion prioritized two tests[2] for immediate focus: the Slosh Box Disintegration Test (FG502) and the Municipal Sewage Pump Test (FG507).

Below is a summary of the key changes in this edition:

Table 1 – Summary of changes in GD4

Area of change	Nature of change
Code of Practice	**New requirements** 1. All baby wipes to have "Do Not Flush" (DNF) logo on pack 2. DNF logo required on front or top of pack 3. DNF logo required to be reasonably visible near the point of dispensing
FG502 Slosh Box	**Method and criteria change** 1. Test duration reduced from 3 hours to 60 minutes 2. Pass criteria changed from >25% to >60% of product dry mass to pass through a 12.5 mm sieve
FG507 Municipal Pump	**Criteria change** 1.Pass Criteria changed from <15% to <5% average power increase over baseline

2. Labeling Code of Practice

Collection studies[1] have provided industry and Wastewater stakeholders with key data regarding the range of materials present in wastewater systems. Understanding the different materials and their relative impact measured in lab tests allows stakeholders to prioritize efforts to reduce the areas of greatest potential burden.

The Labeling Code of Practice (COP) provides a decision tree[3] for producers/marketers of wipes to use to determine if a wipe should be marked with a "Do Not Flush" symbol or can be marketed as "Flushable". This guidance is intended to ensure that only wipes likely to be contaminated with human waste that meet the assessment criteria may be labeled as "Flushable" while others need a "Do Not Flush" symbol on package. Refer to Appendix 2 for the full text of the COP.

Given the persistence of baby wipes and other non-flushable wipes found in collection studies, the updated Code of Practice imposes strong guidelines for prominently displaying the "Do Not Flush" symbol on specified wipes, and added prominence requirements for baby wipes packaging.

In 2014, an award winning[4] pilot education program in Maine was conducted as a collaboration between INDA, the Water Environment Federation and the Maine Water Environment Association (MeWEA). The pilot employed a simple, direct message: "Save

2 See Appendix 5

3 See Appendix 2

4 https://archive.epa.gov/epapages/newsroom_archive/newsreleases/08935b9da7ee36e885257cca0050b198.html

your pipes: don't flush baby wipes!" While active, this approach demonstrably changed consumer behavior, resulting in a ~50% reduction[5] in baby wipes identified in the collection studies conducted in the six weeks immediately following the campaign.[6,7]

3. Flushability Assessment

3.1 Principles

The toilet and the wastewater system should not be used as a receptacle for general waste. In their original design, sewage systems were intended to convey human waste and wastewater. More recently, toilets have been increasingly used for the disposal of a variety of products; many of which are not designed or marketed to be flushed, and which, when flushed, can create operational issues for property owners and operators of wastewater treatment systems.

For public health and hygiene reasons, there are products for which flushing represents not only an acceptable but also the most appropriate means of product disposal, providing they are compatible with the wastewater unit process through which they will pass.

Wastewater disposal and treatment systems differ by country and region, but commonly involve disposal of products via the toilet, conveyance via drainage pipes and pumps and physical, biological and chemical treatment processes. A product's fate, behavior and effects during the various stages of toilet disposal, wastewater conveyance and treatment is determined by the physical and chemical attributes of the product itself.

For a product to be deemed flushable there must be evidence indicating that it:

- clears toilets and properly maintained drainage pipe systems when the suppliers recommended usage instructions are correctly followed;
- passes through properly maintained wastewater conveyance systems and is compatible with wastewater treatment, reuse and disposal systems without causing system blockage, clogging or other operational problems; and
- is unrecognizable in effluent leaving on-site and municipal wastewater treatment systems and in digested sludge from wastewater treatment plants that are applied to soil.

The assessment is designed to evaluate the ability of a disposable nonwoven wipe to conform to each of these above criteria. Consequently, when a wipe fulfills the requirements in this assessment, it is considered compatible with home plumbing, conveyance and treatment and can be labeled flushable in accordance with the INDA/EDANA Code of Practice.

Before undertaking a Flushability Assessment, manufacturers are expected to have verified the human and environmental safety of all components of their finished products and complied with all relevant law and regulations in bringing a product to market. As new regulations are developed (for example, the Single-Use Plastic Directive being drafted in the European Union), manufacturers are expected to comply with all new regulations and legislation relevant to flushable wipes. In this way, not only is wastewater infrastructure protected, but also public health and the environment.

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5 Collected on a "per 100,000 gallons of influent".

6 See Appendix 6

7 https://www.youtube.com/watch?v=CMnRYMccHAM, https://www.youtube.com/watch?v=8dMn6uQOg-4

3.2 Scope

This Flushability Assessment has been designed for disposable nonwoven wipes, which due to their purpose and use have the potential to be disposed of via the toilet into the wastewater system. The technical assessment outlined in this document assesses compatibility with plumbing fixtures and drainage pipes, on-site treatment, and municipal wastewater conveyance and treatment systems.

Sanitary systems found in temporary rest rooms (e.g. Porta-John, Port-O-Let, Port-a-Loo), motor homes, recreational vehicles, boats, etc., are outside the scope of this document.

3.3 Boundaries

The test method development and the validation for this technical assessment have been based on disposable nonwoven wipes. Using this assessment approach for other product types may require further development and validation not contained in this document. The principles of these guidelines and the test methods developed are supported by collection study data in the UK and USA and can apply to other countries. Knowledge of local habits/practices/infrastructure in the regions concerned is advised but not covered in this document.

3.4 Overview

When a product is disposed of via the wastewater system, first, it is flushed down the toilet and then it is conveyed via drainage pipes in order to be treated either in an on-site treatment system or in municipal treatment systems. The assessment therefore contains the following evaluations, all of which must be addressed.

3.4.1 Residential pathway

This pathway requires evaluation of the performance of a disposable nonwoven wipe to ensure the product to successfully clear a toilet and building drainage lines and ensure that the wipe does not clog, accumulate within or otherwise interfere with normal system operation under high usage conditions of a household ejector pump.

3.4.2 On-Site Pathway

This pathway requires evaluation of the performance of a disposable nonwoven wipe to assess the potential of a disposable nonwoven wipe to settle in sumps, septic tanks, and on-site aerobic systems, and to assess the potential for a disposable nonwoven wipe to biologically degrade under aerobic and anaerobic conditions found in on-site systems.

3.4.3 Municipal Pathway

This pathway requires evaluation of the performance of a disposable nonwoven wipe to ensure the product is compatible with a municipal sewer system or wastewater treatment units.

3.5 Assessment Summary

In each of the three pathways, test methods are assigned to evaluate key requirements – See Figure 1. Only attainment of the acceptance criteria for all seven tests demonstrates compatibility with the wastewater system and allows a disposable nonwoven wipe to be labeled as "Flushable".

No one single test can be considered as an indicator for a disposable nonwoven wipe to be considered flushable; failure to meet any one of the acceptance criteria would require the product be labeled "Do Not Flush" in accordance with the COP.

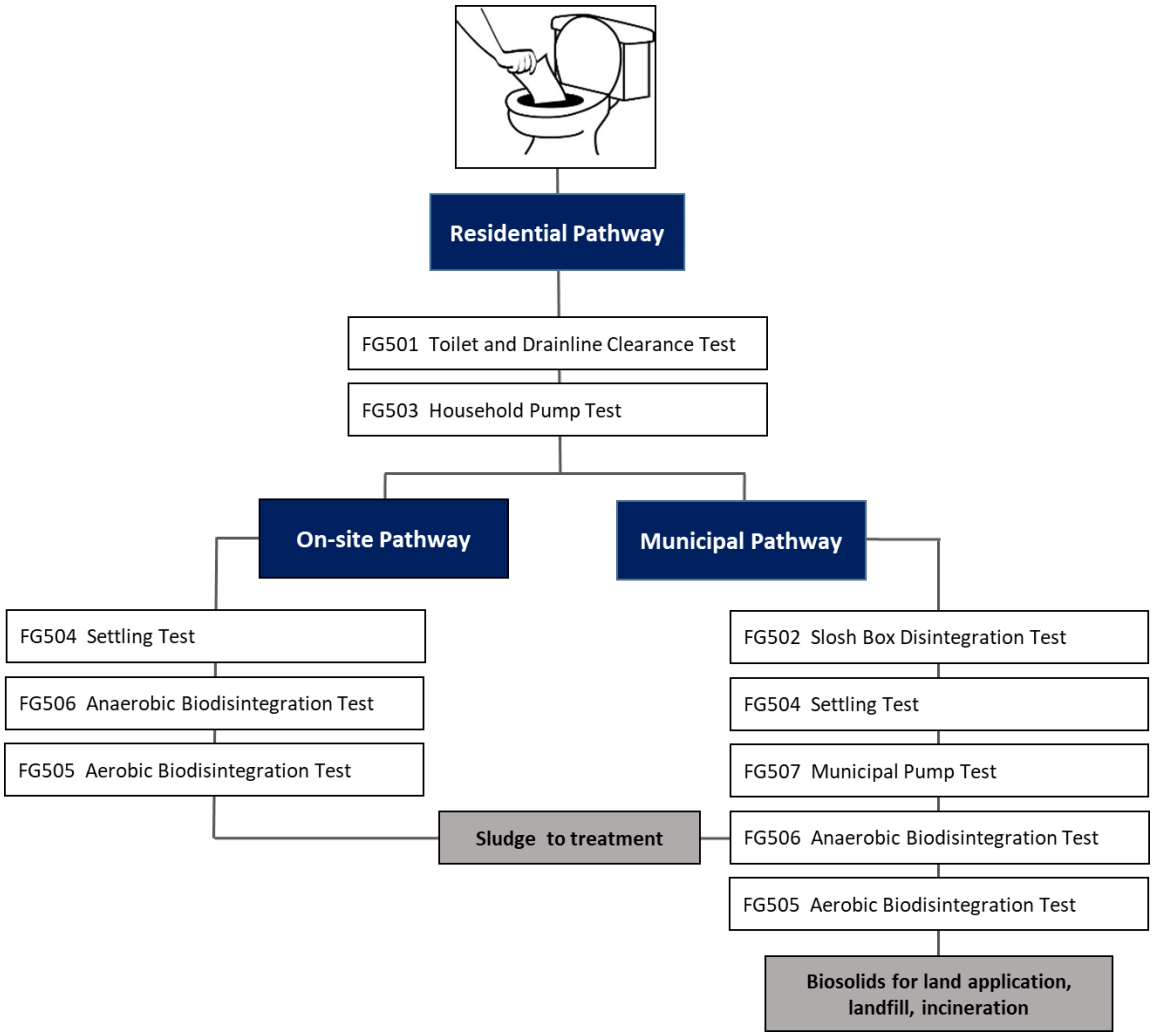


Figure 1: **The disposal pathways indicating key performance requirements and relevant test methods.**

The full test methods and supplementary guidance documents for use in laboratories are available for download at the INDA/EDANA websites[1].

4. Summary of Test Methods and Acceptance Criteria

4.1 FG501.R1(18): Toilet and Drain-line Clearance Test

Purpose	To assess the potential of a disposable nonwoven wipe to successfully clear a toilet and building drainage lines.
Principles	The test system consists of a toilet and drain-line. Several different toilet and drain-line combinations are contained in the full test methods that cover typical configurations in the US, EU (including UK), and Australia. The ultimate choice of toilet and drain-line configuration should be based upon the region where a product is marketed. The test itself simulates two days of normal toilet use by a family of four and is repeated at least three times. The test system consists of a toilet and drain-line. In the case of nonwoven wipes used for toileting, a test consists of 35 toilet flushes using a specified loading sequence of product based on the habits and practices of a family of four. This sequence includes flushes with water only, flushes with wipes and toilet tissue, and flushes with wipes, simulated fecal material (SFM) and toilet tissue. The test run continues until all the material loaded for the 35th flush exits the drain-line. For products other than nonwoven wipes used for toileting, the loading sequence should be amended to reflect specific habits/practices for that product. For each flush, observations are made regarding whether the material clears the toilet bowl and trap. In addition, the travel distance is measured for all flushed materials in the drain-line following each flush. The latter information is used to calculate the location of the center of mass of all materials within the drain-line relative to the toilet. Prior to conducting a study, a 35 flush sequence excluding test product and with toilet tissue and SFM only is used to establish a baseline for each specific toilet and drain-line configuration to ensure correct operation of the system. The baseline run continues until all the material loaded for the 35th flush exits the drain-line.
Validity Criteria for the Test System	**In the baseline evaluation**: In the absence of product, no clogs should occur that require use of a plunger to clear toilet tissue and excess water from the bowl and trap. The travel distance of the Center of Mass of the toilet tissue must not consistently decrease over the course of five consecutive flushes.
Pass/Fail Criteria	**To be acceptable:** **Toilet Clearance:** No more than one of the flushes containing nonwoven wipe(s) should be associated with a clog that requires use of a plunger to clear product and excess water from the bowl and trap. **Drain-line Clearance:** The travel distance of the Centre of Mass of the flushed material in the drain-line does not consistently decrease over the course of five consecutive flushes.

4.2 FG502.R1(18): Slosh Box Disintegration Test

Purpose	To assess the potential for a disposable nonwoven wipe to disintegrate when subjected to mechanical agitation in water or wastewater (optional).
Principles	The test system consists of a box oscillating at 26 rpm, containing 2 liters of tap water or wastewater (optional) in which a single individual nonwoven wipe is run for 60 minutes. Subsequently, the contents of the box are transferred to and then rinsed through a 12.5 mm perforated plate sieve resting at least 2" above a surface. The portion of the wipe retained on the sieve are recovered, dried and analyzed gravimetrically. This measurement is used to calculate the percent of the wipe's initial dry mass passing through the sieve based on difference. At a minimum, this test is repeated with six replicate wipes.
Pass/Fail Criteria	**To be acceptable:** The percent of the starting dry mass passing through the 12.5 mm perforated plate sieve after 90 minutes must be greater than 60% for at least 80% of the individual replicates tested.

4.3 FG503.R1(18): Household Pump Test

Purpose	To assess the compatibility of a disposable nonwoven wipe with household sewage ejector pump systems to ensure that the wipe does not clog, accumulate within or otherwise interfere with normal system operation under high usage conditions.
Principles	An accelerated six day loading protocol is used to verify that the wipes do not clog, accumulate within or otherwise interfere with normal operation of a sewage ejector pump system under high usage conditions. The test system includes a toilet and drain-line, connected to a household sewage ejector pump assembly, consisting of a basin and submersible pump. Upon activation, the pump discharges the basin contents upward through a check valve and into an 8-10 ft section of vertical pipe connected by elbow to another section of pipe with a 1-2% downward slope connected by elbow to another section of vertical pipe draining through a screen to a drain. Wipes are flushed down the toilet. The loading protocol consists of two loading sequences each day with each sequence consisting of a total of twelve flushes with six including wipes. After each flush, the basin is inspected to determine if the product is interfering with the float device activating the pump. In addition, during each pump run, the system is observed to determine if the pump shuts off before fully emptying the basin and if the pump is effectively pumping water from the basin. At the end of each day, the number of wipes in the basin is determined. On completion of the final loading sequence, the toilet is flushed as needed to trigger the pump one final time. Subsequently, all wipes in the basin are removed and counted. The numbers of wipes observed in the basin when the system is in a steady state at the end of days two through six are averaged, and this value is compared to the number of wipes loaded each day. For wipes which are buoyant in tap water, 150 g of simulated fecal material (SFM) can be included in two of the flushes within a sequence to simulate the normal presence of fecal solids. For products other than nonwoven wipes used for toileting, the loading sequence and daily quantification of product in the basin should be amended to reflect specific habits/practices for that product.
Pass/Fail Criteria	**To be acceptable:** The nonwoven disposable wipe must not cause the system to stop functioning at any point during the test. AND The average number of wipes remaining in the basin at the end of days two through six must not exceed the number of wipes loaded on a daily basis.

4.4 FG504.R1(18): Settling Test

Purpose	To assess the potential of a disposable nonwoven wipe to settle in sumps, septic tanks, on-site aerobic systems and settling chambers that are associated with pump stations and municipal wastewater treatment plants.
Principles	The test system consists of a 20 cm diameter clear plastic column containing tap water that allows the settling behavior of a wipe to be observed. The column has graduations that are used for determining the time needed for a wipe to descend a pre-determined distance in the column. Individual wipes are rinsed in water or flushed through a test drain-line before being added to a beaker containing 1 L of tap water. The contents of the beaker are poured into the top of the column, and the settling rate is calculated from the wipe's travel time. This process is repeated for ten separate wipes and the average settling velocity is calculated. The settled wipes are then left in the column for 24 hours to verify that they do not become buoyant and float. Before initiating the test, the rinsed wipes are placed in tap water. In the event that they float, they can be gently swirled in wastewater for 30 seconds to allow adsorption of solids prior to being placed in the beaker used for dosing the column.
Pass/Fail Criteria	**To be acceptable:** The average settling velocity for the wipes that settle must exceed 0.1 cm/sec and at least 95% of the total wipes tested must settle. AND At least 95% of the wipes tested must not become sufficiently buoyant to rise more than 30 cm from the bottom of the column within 24 hours.

4.5 FG505.R1(18): Aerobic (A) Biodisintegration/(B) Biodegradation Tests

Purpose	Either of these tests can be used to assess the potential for a disposable nonwoven wipe to biologically degrade under aerobic conditions typically found in sewers as well as on-site and municipal wastewater treatment systems. These methods will determine if a wipe contains materials that do not degrade biologically in the presence of oxygen.
Principles	**PART A – BIODISINTEGRATION TEST** This test measures the total mass of a wipe retained on a 1 mm sieve after being incubated with activated sludge for 14 days at ambient laboratory temperature. Samples of a wipe are placed in triplicate 2.8 L baffled flasks containing 1 L of activated sludge, which has been pre-screened through a 1 mm wire mesh sieve. In addition, identically prepared treatments with USP cotton serve as a positive control. These systems are agitated on a rotary shaker table to provide continuous aeration of the sludge throughout the test. After 14 days, the contents of each flask are passed through a 1 mm wire mesh sieve and the material retained on the sieve is recovered, dried and analyzed gravimetrically. The percent of the initial sample mass passing through the sieve is calculated based upon difference. The average is calculated for the three replicates. **PART B – BIODEGRADATION TEST** The OECD 301B method is a standardized biodegradation test that measures the evolution of carbon dioxide resulting from the mineralization of the organic constituents in the wipe. Samples should be rinsed prior to testing.
Pass/Fail Criteria	**To be acceptable:** **Part A – Biodisintegration Test:** The average percent of initial dry mass passing through the 1 mm sieve after 14 days should exceed 95%. **Part B – Biodegradation Test:** The average percent of theoretical carbon dioxide produced after 28 days must exceed 60%. Any remaining fraction of the test substance is assumed to be incorporated into biomass or present as products of biosynthesis.
Additional information	The OECD 301B test method can be downloaded from the OECD website http://www.oecd-ilibrary.org/

4.6 FG506.R1(18): Anaerobic (A) Biodisintegration/(B) Biodegradation Tests

Purpose	Either of these tests can be used to assess the potential for a disposable nonwoven wipe to biologically degrade under anaerobic conditions typically found in sewers as well as on-site and municipal wastewater treatment systems. These methods will determine if a wipe contains materials that do not degrade biologically in the absence of oxygen.
Principles	**PART A – BIODISINTEGRATION TEST** This test measures the total mass of a wipe retained on a 1 mm sieve after being incubated in anaerobic sludge for 28 days at 35°C. Samples of a wipe are incubated in 2 L vessels containing 1.5 L of anaerobic digester sludge, which has been pre-screened through a 1 mm sieve. In addition, identically prepared treatments with USP cotton serve as a positive control. The flasks are incubated statically and in a way that prevents oxygen from entering the test vessels. After 28 days, the contents of each flask are passed through a 1 mm wire mesh sieve and the material retained on the sieve is recovered, dried and analyzed gravimetrically. The percent of the initial sample mass passing through the sieve is calculated based upon difference. The average is calculated for the three replicates. **PART B – BIODEGRADATION TEST** The OECD 311 method measures the evolution of carbon dioxide and methane resulting from the mineralization of the organic constituents in the product.
Pass/Fail Criteria	**To be acceptable:** **Part A – Biodisintegration Test:** The average percent of initial dry mass passing through the 1 mm sieve after 28 days should exceed 95%. **Part B – Biodegradation Test:** The average percent of theoretical gas produced after 56 days must exceed 70%. Any remaining fraction is assumed to be incorporated into biomass or present as products of biosynthesis.
Additional information	The OECD 311 method can be downloaded from the OECD website http://www.oecd-ilibrary.org/.

4.7 FG507.R1(18): Municipal Sewage Pump Test

Purpose	To assess the compatibility of disposable nonwoven wipes with municipal sewage pumping systems.
Principles	Individual wipes are positioned near the intake of an operating municipal pump and allowed to enter the pump while recording power consumption every second relative to a baseline. The test system consists of an ITT Flygt pump; model C-3085.183, operating at a flow rate corresponding its 100% efficiency point (21.2 L/s or 336 gal/min). The pump is allowed to reach steady state and no adjustments to flow, gate valve positioning, or pump adjustments are made after establishing the baseline flow rate. The pump is allowed to run for five minutes at this condition to determine a steady state / baseline for power consumption prior to introducing products. Subsequently, a wipe is introduced every ten seconds for ten minutes (total of 60 wipes) at the pump intake. At the end of the sample introduction, the system is allowed to run for an additional five minutes. The pump power consumption and flow rate on the outlet are continuously monitored and recorded. The test consists of five separate runs as described above, each of which involves the use of 60 wipes. For each of the five runs the percent power increase over the baseline power is determined for every data point. In addition, the areas under the power curves for the baseline and test periods during the run are integrated and then used to calculate the percent power increase over baseline.
Pass/Fail Criteria	**To be acceptable:** Based upon integration of the power curves, the average percent power increase over baseline for the five runs must not exceed 5%.

5. Appendices

Appendix 1: Glossary of Terms

For a product to be deemed flushable there must be evidence indicating that it:

- Clear toilets and properly maintained drainage pipe systems when the suppliers recommended usage instructions are correctly followed;
- Passes through wastewater conveyance systems and is compatible with wastewater treatment, reuse and disposal systems without causing system blockage, clogging or other operational problems; and
- Is unrecognizable in effluent leaving on-site and municipal wastewater treatment systems and in digested sludge from wastewater treatment plants that are applied to soil.

The assessment is designed to evaluate the ability of a disposable nonwoven wipe to conform to each of these above criteria. Consequently, when a wipe fulfills the requirements in this assessment, it is considered compatible with home plumbing, conveyance and treatment and can be labeled "Flushable" in accordance with the INDA/EDANA Code of Practice.

There are many terms used in discussions about flushability. For the ease of use of readers, we have listed below the most commonly used terms in this document together with a brief description of the meaning applied to it in these guidelines.

Aerobic Process: A biochemical or biologically mediated process occurring in the presence of and typically requiring molecular oxygen.

Anaerobic Process: A biochemical or biologically mediated process which occurs in the absence of molecular oxygen. Such processes are typically divided into facultative anaerobic processes that occur both in the presence and absence of oxygen and obligate anaerobic processes that occur only when oxygen is absent.

Biodegradation: The chemical breakdown of materials by living organisms into simpler molecules. It is catalyzed by naturally occurring microorganisms, typically bacteria and fungi, which use the material as a source of energy and carbon. **Mineralization** is one process occurring during biodegradation, whereby the material is completely mineralized to simple inorganic molecules (e.g. carbon dioxide, methane, nitrate, ammonia). Another process is incorporation of some of the molecular constituents into new microbial biomass. Consequentially, for a material to be considered completely biodegradable, the parent material must disappear, substantial amounts of carbon dioxide (aerobic conditions) and/or methane (anaerobic conditions) must be produced and there should be no persistent constituents remaining or persistent metabolites produced.

Biodisintegration: Disintegration that involves biodegradation (see Disintegration).

Clog: A restriction or blockage in a toilet, pump, pipe or other conduit that limits the free flow of water that can result from the presence of an object or an accumulation of materials.

Degradation: The breakdown of a material into simpler molecules as a result of biological or chemical processes.

Digested Sludge: The settled wastewater solids that have been degraded and stabilized under either aerobic or anaerobic conditions – also known as biosolids.

Disintegration: The process in which a material weakens, loses its integrity and breaks into smaller parts. It is operationally defined by measuring mass loss of the material or estimating the mass of the material that passes through sieves after exposure to specific environmental conditions. Disintegration can be the result of dissolution of soluble components, chemical or biological degradation of constituents in the material, physical forces that break the material into smaller particles or a combination of the above.

Dispersion: A disintegration process that is characterized by a material breaking into fine particles that separate from each other and distribute themselves more or less evenly in water. It is operationally defined by measuring mass loss of the material or estimating the mass of the material that passes through sieves after exposure to specific environmental conditions.

Disposable product: A product designed for single use rather than for medium to long term durability. Such products may be termed consumables.

Disposal Pathways: Various routes by which a product may be disposed. In the case of a flushable product, this pathway would include the building's toilet and drain-line system and the wastewater conveyance system (e.g. sewer). Depending upon the system, it could also include pump stations, and a wastewater treatment plant.

Drain-line: The pipe system that transports wastewater from the toilet, through the building to the on-site wastewater treatment system or to the municipal sewer collection system.

Durable product: A product that yields utility over time and is not consumed in one use.

EDANA: EDANA is the international association serving the nonwovens and related industries.
Address: Avenue Herrmann-Debroux 46, 1160 Brussels. Belgium.
Tel: +32 27349310
Web: http://www.edana.org/industry-initiatives/flushability

Ejector Pump: Equipment typically used within a building to lift wastewater when gravity flow cannot be maintained. In a residential setting these systems are usually found in basements and typically consist of a basin connected to the toilet containing a submersible centrifuge type pump with an open impeller design that can pass solids less than 5 cm in size.

INDA: INDA is the "Association of the Nonwovens Fabrics Industry" (previously International Nonwovens and Disposables Association).
Address: 1100 Crescent Green, Suite 115 Cary. NC 27518.
Tel: +1 919-459-3700
Web: www.inda.org/issues-advocacy/flushability

Lift Station or Pumping Stations: Wastewater pumping facility that lifts wastewater from lower to higher elevation. Lift stations is the terminology most commonly used in the United States; pumping stations is the terminology used in Europe.

Municipal Pump: A pump used in a sewer lift station or within a sewage treatment plant that is used to move wastewater.

Nonwoven: A fabric made directly from a web of fibers or continuous filaments without the yarn preparation necessary for weaving or knitting**.**

Physical Disintegration: The process, in which a material weakens, loses its integrity or breaks into smaller parts as a result of physical forces. In some cases, physical disintegration occurs only after a material has been weakened by other processes such as for example biodegradation.

Product Flush: Term used in the test methods to describe the process of placing a product in the toilet bowl and activating the flow of water into the bowl.

Properly Maintained Drain-lines: Are equivalent to "Fit for Purpose" sewer pipes in this document.

Re-usable Product: A conventional re-usable product is a product that can potentially be used again for the same function after it has been used once.

Settling: The downward movement of a material or suspended solids in a water column as a result of gravitational forces.

Septage: The contents (liquid and solid fractions) pumped from a building's septic or holding tank. Depending on the location, this raw or untreated sewage is treated at a municipal wastewater treatment plant, treated in a separate treatment facility or land applied.

Sewer Collection System: System of conduits used to remove and transport human waste and wastewater. They typically begin with connecting pipes from buildings to one or more levels of larger underground horizontal mains, which terminate at wastewater treatment plants. Flow in sewer pipes is generally by gravity, though pumps may be used if necessary.

Simulated Fecal Material (SFM): A material that is used to simulate the presence of feces in a flushability test. It consists of a material that replicates the physical properties and consistency of human adult feces.

Slosh Box: Test equipment used to assess the potential for a product to disintegrate when it is subjected to mechanical agitation in water or wastewater.

Solids Retention Time (SRT): Term used to describe the average time that sludge remains in a treatment process, such as an activated sludge basin or digester. In the case of activated sludge processes, SRT can also be referred to as Sludge Age (SA) or Mean Cell Retention Time (MCRT).

Toilet Flush: Term used in the test methods to describe the process of activating the flow of water into the bowl of a toilet.

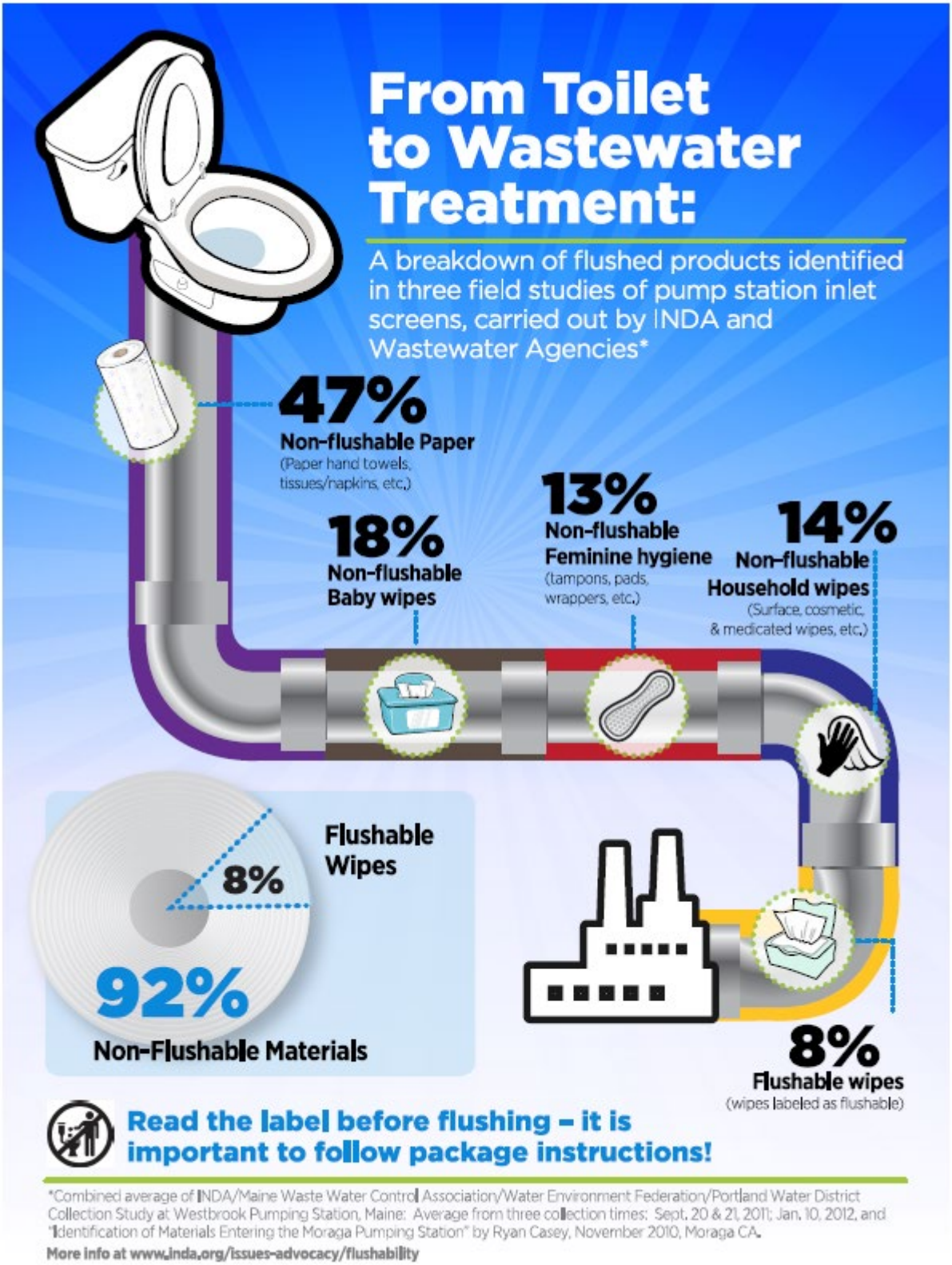
TWG: Technical Work Group comprising members from North American Clean Water Agencies (NACWA), Water Environment Federation (WEF), American Public Works Association (APWA) and INDA who met during 2014 to review GD3 and decide on areas for future improvement.

Wastewater Solids Disposal System: Term to describe the processes used to manage sludge solids leaving a wastewater treatment plant. Various forms of disposition include land filling, incineration and beneficial use as a soil amendment.

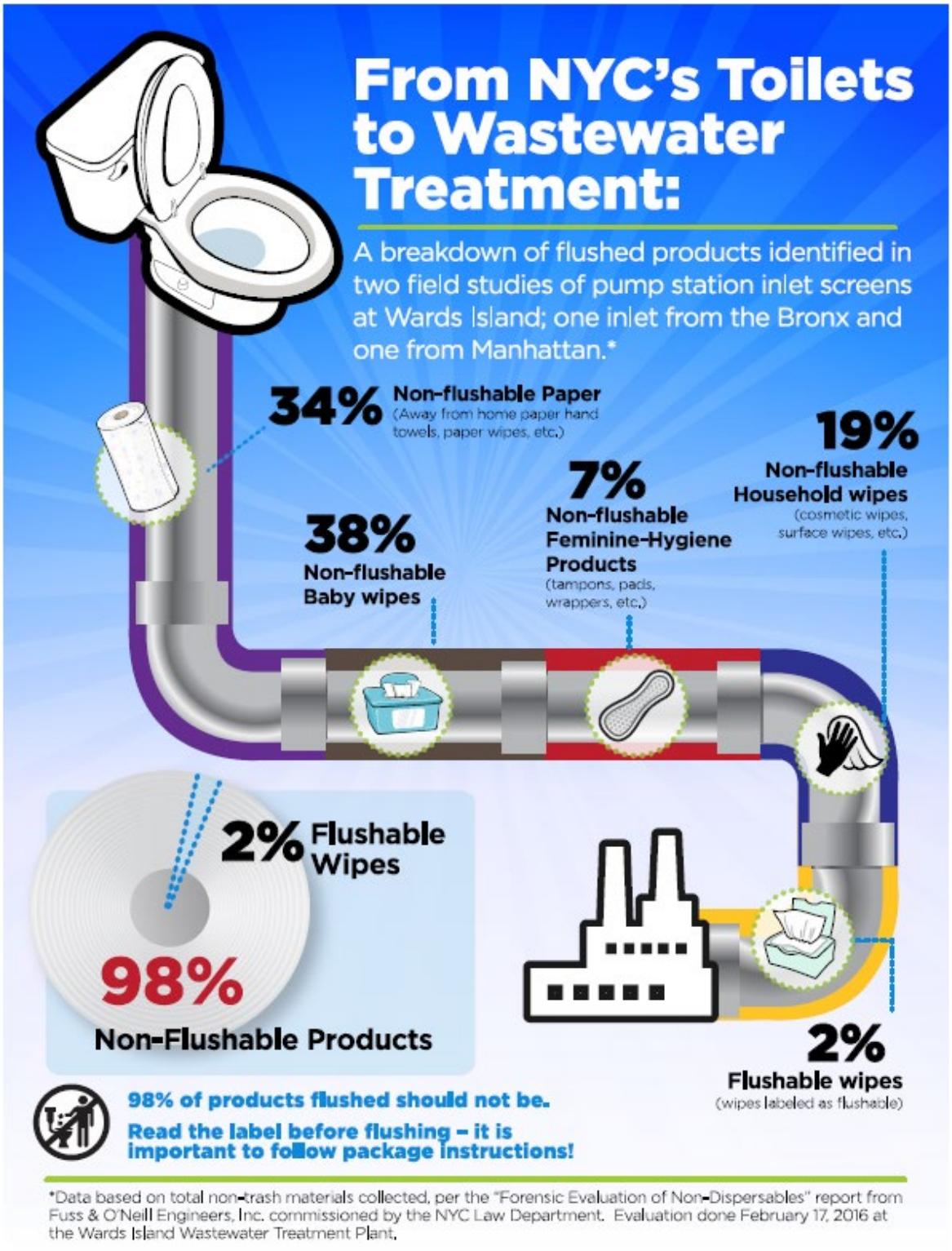
Appendix 2: Code of Practice

The labeling Code of Practise was carved out after the 2021 revision of the COP, when the SUPD label had been included.

Appendix 3: Infographic pre Edition 3 (2010-2012)



Appendix 4: Infographic post Edition 3 (2016)



Appendix 5: TWG Final Finding 18

Finding 18 – Testing Priorities

	Priority for Recommendations				
	Very High	High	Medium	Low	Very Low
FG501 – Toilet and Drainline Test					✓
FG502 – Slosh Box Disintegration Test	✓				
FG503 – Household Pump Test		✓			
FG504 – Settling Test				✓	
FG505 – Aerobic Bio-Disintegration Test			✓		
FG506 – Anaerobic Bio-Disintegration Test			✓		
FG507 – Municipal Pump Test	✓				

Appendix 6: 2014 Maine Education Pilot – Final Report

INDA-MEWEA "Don't Flush Baby Wipes" Pilot Public Education Campaign

Final Report
April 2015

INDA, the Association of the Nonwoven Fabrics Industry, and the Maine Water Environment Association (MEWEA; formerly known as the Maine Waste Water Control Association [MWWCA]), jointly committed to conduct a pilot consumer education campaign in Maine. This commitment represented an alternative to legislation proposed by the then-MWWCA in January 2011 that would have created a state-specific approach to the sale and distribution of products labeled as flushable. This campaign was part of a continuing industry/wastewater collaborative effort to resolve impacts on private plumbing and municipal sewer systems caused by products that should not be flushed, such as baby wipes.

The development of the Maine pilot public education campaign occurred from January 2012 through late 2013, and the campaign was executed and analyzed during the first half of 2014. The multimedia campaign was intended to produce positive impacts on consumer awareness and measurable changes in behavior within a limited portion of the sanitary sewer served by the Portland Water District in Greater Portland. The consumer understanding was validated by market research focused on this limited service area, and the consumer behavior change was validated by an observed reduction in the number of baby wipes being disposed by flushing in the limited service area during a time period closely following the campaign.

The campaign materials developed were able to show effective improvement in addressing the issue of improper flushing of a non-flushable product. Moreover, the messaging vehicles were identified which were effective at providing community-level public education as well as at creating consumer behavioral change. The messaging was found to be most effective at modifying consumer behavior in the first four weeks immediately after the public education campaign, with the number of baby wipes observed climbing to pre-campaign levels after those four weeks.

Objectives:

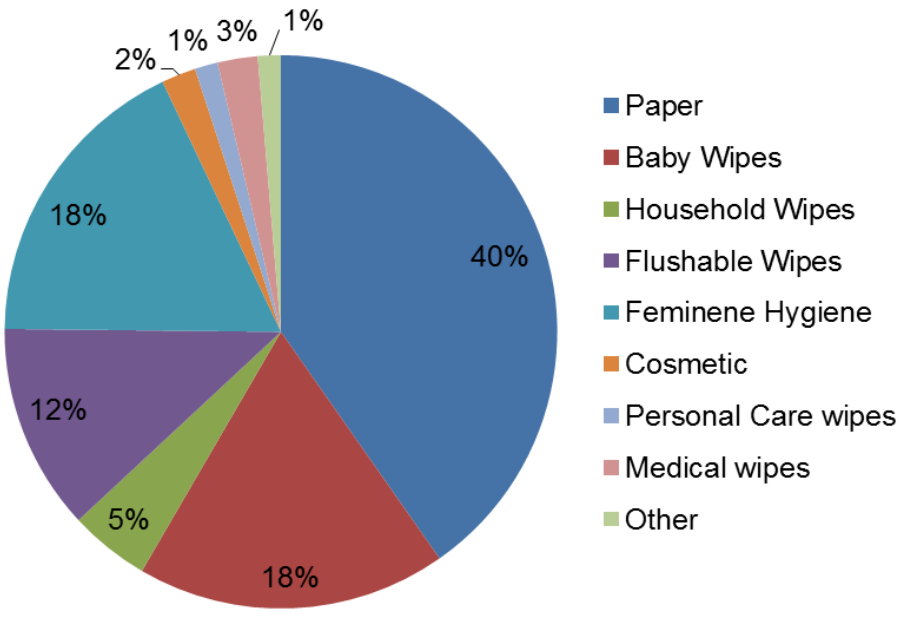
The pilot public education campaign objectives were the following:

1. To raise consumer awareness of the issue (e.g. flushing baby wipes and the impact it can have on their pocketbook, wastewater system and environment and other) and change their attitudes regarding flushing baby wipes.

2. To change consumer flushing behavior to reduce the amount of baby wipes being flushed as a result of the messages delivered by the pilot education program.
3. To validate the flushing behavior change by measuring the quantity of baby wipes captured on screens at the Cottage Place pump station both pre and post campaign.
4. To learn which messaging and vehicles aided in awareness, claimed behavior, and behavior change.
5. To increase awareness of disposal instructions on package ('When in doubt of any instructions or other – throw it out') and measure consumer behavior of looking for and adhering to instructions.

Background:

Prior to the Maine pilot public education campaign, collection data gathered jointly by INDA and MEWEA (with assistance from Water Environment Federation [WEF] representatives) at the Portland Water District Cottage Place Pump Station's influent screen had identified significant quantities of paper towels, feminine care products, baby wipes, hard surface wipes and other improperly flushed personal care wipes. Additionally, data gathered at this facility in Westbrook, Maine had indicated that baby wipes could have been a significant driver of historic pump clogs at the facility (prior to installation of the influent screen) since collection study showed that they were approximately 20% of the total by count.



The Greater Portland media market (fully overlapping with the service area to the Cottage Place Pump Station) was chosen as the target area for an advertising campaign designed to improve the level of awareness of this issue and change behavior regarding the flushing of baby wipes. The advertising test was conducted in Q1 2014. Quantitative research was conducted Q4 2013 and Q2 2014 to measure the effectiveness of this advertising campaign.

- A pre-wave analysis was conducted to measure awareness of the issue prior to the campaign's launch.
- A post-wave analysis was conducted at the end of scheduled primary media blitz.
- Data from the pre-wave was compared to data collected post-wave to measure the effectiveness of the campaign.
- A count of actual baby wipes flushed on a pre/post basis was conducted at the Cottage Place Pump Station to determine if observations mirrored reported behavior changes. The total number of baby wipes entering the station was normalized per 100,000 gallons of flow during the collection period (as measured by flow meters at the pump station), to provide a consistent metric.

Campaign Details: 'Save Your Pipes, Don't Flush Baby Wipes'

Target Audience	Baby wipes users within the Greater Portland Time Warner Cable (TWC) Zone were targeted through TV and other media. • Consumers on public sewer systems who use baby wipes for personal care to change their behavior by educating them about the clogging issue and its consequences. • Baby wipe users include households with and without children, (both resident and businesses) in the Cottage Place Pump Station service area, which includes parts of Westbrook, Gorham and Windham (considered part of the Greater Portland media market).
Schedule/Timing	**Oct–Dec 2013** Public awareness research of issue (to be used for campaign data analysis) • Pre-wave report issued (12/4) **Oct–Nov 2013** Forensic data collection at Cottage Place Pump Station in Westbrook, ME **Dec 2013** Campaign Concept Approval **Dec–Jan 2014** Development of production materials **1/21/2014** Kick-off Press Conference (Westbrook, ME) **Jan-Mar 2014** Time Warner Cable TV spots (8 weeks) Additional media • Local print ads/inserts, • Website (Saveyourpipes.org), • Social media (Facebook), • Signs/information at Hannaford stores, • Flyers in public restrooms, • Sticky note on the front page of Portland Press Herald, • Local news stories,

	• Bill stuffers **Mar-Apr 2014** Measure of campaign effectiveness: • Issue awareness • Issue understanding and attitude • Campaign awareness • Claimed behavior • Measured observations compared to reported behavior changes. **Apr-May 2014** Forensic data collection at Cottage Place Pump Station
Budget	$113,000 Total Campaign Budget Cap: • $30,400 Research Budget • $40,500 Media Budget • $22,000 Production Budget • $20,000 Services Budget Financial commitment from both INDA and MEWEA. • Materials produced to be used by manufacturers and utilities in other municipalities around the US • MEWEA contributed $15,000 (much of it donations from its members and partners around the country) and the time of its volunteers. • $98,000 funded by INDA through its member company contributions.
Brand Character/Tone	Campaign concepts ranged from Informational/public service announcement style to Edgy/Humorous. The style was refined based on pre-wave research results.
Creative/Tactical Considerations	Campaign needed to be scalable to other markets as well as to other disposable products which are not intended to be flushed. Additional tactics/ materials were developed, but not implemented in the Portland market. They are part of a creative template "toolbox" to be utilized by manufacturers and utilities in other markets and municipalities.

Awareness Results

To raise consumer awareness of the issue and to change consumer flushing behavior, a single message was used throughout the communication campaign of 'Save Your Pipes: Don't Flush Baby Wipes'. This singular message clearly shared with the consumer that baby wipes were not flushable and that they cause expensive problems by clogging both residential plumbing and public sewer systems when flushed. This message was shared with the public by a variety of methods shown in Appendix B.

Television ads, produced and aired at a cost of $24,000, were shown on Time Warner Cable (TWC) and were the dominant source of awareness for the campaign; 81%

recall. This was followed by local news stories (17% recall) and local print ads/inserts (12% recall). The campaign's website and placed posters were not as noticed among these campaign tactics. Few (3%) noticed the bill stuffers, which has been a popular method used previously by wastewater utilities.

Based on Portland area consumer polling before and after the campaign, consumer awareness of "Don't Flush Baby Wipes" message had increased.

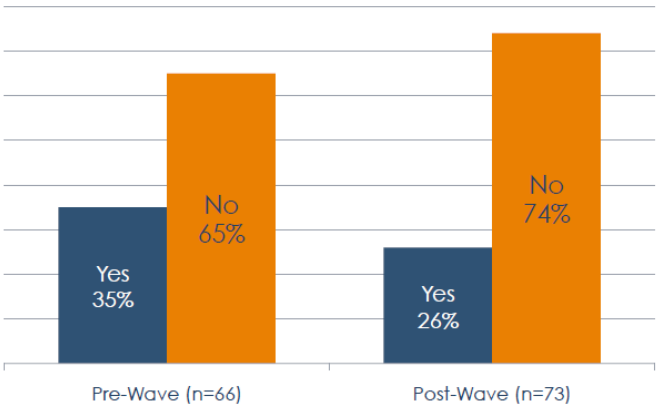
- Awareness of the message was 4 times greater after the campaign
- Consumer belief that baby wipes aren't safe to flush reached the 2/3 mark after the campaign
- Awareness of among Time Warner Cable customers was 10 times greater after the campaign

Behavior Change Results

Nearly four out of ten respondents who recalled the ad slogans noted they would be less likely to flush or will no longer flush baby wipes. After the campaign, baby wipes users in Portland area increased their reported frequency of disposing baby wipes in the trash instead of the toilet. Additionally, a significant reduction was reported by consumers who previously said they flushed baby wipes "occasionally"; a drop from 29% to 21% after the campaign.

	Recall Specific Ad Slogan (n=52)
NET: I am less likely to flush baby wipes/I no longer flush baby wipes	**37%**
I am less likely to flush baby wipes	23%
I no longer flush any baby wipes	21%
I am more likely to tell others not to flush baby wipes	**31%**
This advertisement has had no effect on me	**29%**
I am now more likely to read baby wipes packaging	8%
I am now less likely to purchase baby wipes	6%
I have switched from baby wipes to flushable wipes	4%

Even though many of the baby wipes users referenced that they 'looked at the baby wipes package' to determine if it is safe to flush/not safe to flush, most have actually never looked at the package for flushing instructions – and this lack of tendency has not changed even with the campaign messaging to read packaging for "do not flush" instructions. However, at the time of the campaign, with the exception of the leading brands, many baby wipes sold in the target area did not contain disposal instructions; the inclusion of the "do not flush" message on packages has improved since that time.

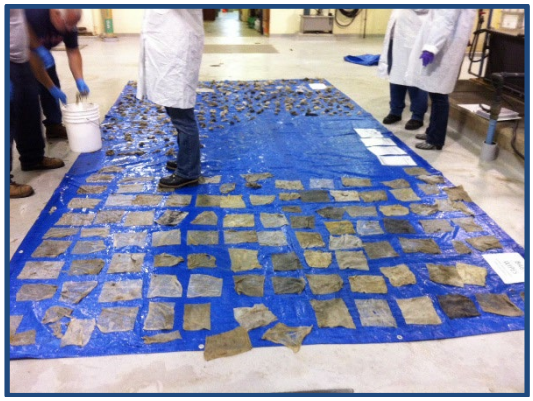


Have you ever looked on a baby wipes package for disposal instructions?

Validation of the flushing behavior change

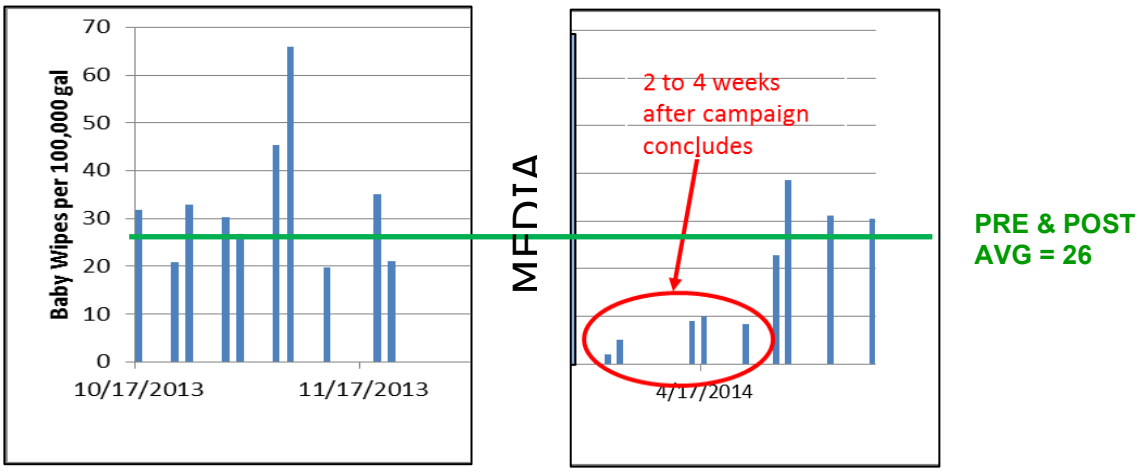
To measure the effectiveness of the campaign, and specifically to determine if observed results mirror reported behavior changes, on-site analysis of materials found in the Cottage Place Pump Station (a subset of the Greater Portland market reached by the campaign) was conducted. Pre- and post- pilot data collection occurred 6 weeks before and after the pilot campaign at the Cottage Place Pump Station in Westbrook, Maine. Sorting was conducted by MEWEA/Portland Water District members and INDA industry members.

Aubrey Strause (MEWEA), Kim Babusik (Industry member), Gayle Rece (Industry member), and Scott Firmin (MEWEA) compare a wipe to the reference binder



Materials removed during two hours of flow into the pump station, sorted to separate baby wipes (foreground) from other materials (background). Pre-campaign

The following graph and data in Appendix A shows a quantitative measure of baby wipes before and after the 'Save Your Pipes: Don't Flush Baby Wipes' campaign. It is clearly evident that the campaign had a measurable effect on decreasing the number of non- flushable baby wipes flushed into the municipal system. This decrease is most visible in the first four weeks after the campaign concluded.



PRE-CAMPAIGN POST-CAMPAIGN

It was noted that the number of flushed baby wipes started to increase beyond four weeks after the end of the campaign; this points to the need of continuous consumer education for proper product disposal.

Additionally, as the percentage of other articles such as tampons and feminine products remained at a high level, the percentage of baby wipes as compared to total number of articles was shown to be reduced.

Development of a "Toolkit"

To satisfy the pilot education campaign objective of transitioning the creative elements of the Pilot Program into a "toolkit" to be used in other municipalities around the US, MEWEA sought volunteers to create customizable Word documents from the graphic design files provided by the marketing firm. To date, four customizable campaign materials (a bill stuffer, a flyer, and a print ad in two sizes) have been produced by MEWEA and its volunteers

MEWEA hosts these materials and low-resolution versions of the two television ads on its website, www.mewea.org/pump-clog-resources/outreach-materials-dont-flush-baby-wipes-campaign/. This website lists contact information for persons wishing to gain access to the high-resolution television ads, which are too large to put on the MEWEA website. To date, MEWEA has provided files to several municipalities and utilities around the country, although very few have been able to utilize the television ads.

Management of the SaveYourPipes.org website has been transferred from INDA to the National Association of Clean Water Agencies (NACWA), an organization representing wastewater utilities around the country. MEWEA intends to work with NACWA to upload the customizable materials MEWEA has produced on this website for downloading by other municipalities and utilities who may have the ability to use them.

NACWA and WEF have been enthusiastic partners with MEWEA in spreading the word about the availability of the "toolkit" materials.

Discussions about incorporating the results of this pilot education program into future packaging, labeling, and marketing decisions by manufacturers, and to include disposal instructions more prominently (or at all), did not occur as part of the Maine pilot public education campaign. These conversations will be part of a Product Stewardship Initiative (PSI) Technical Workgroup kicking off in March 2015. Members of MEWEA, INDA, NACWA, and WEF who participated in the Maine pilot education program will be participating in the PSI Technical Workgroup. We look forward to providing a future update on the results of these discussions and the conclusions of the PSI Technical Workgroup.

Concluding remarks

The INDA/MEWEA ‘Save Your Pipes: Don’t Flush Baby Wipes’ campaign was able to produce measurable, if temporary, positive impacts on consumer awareness and behavior within the limited service area of the Portland Water District sewer system targeted by the campaign. A quantifiable reduction in the number of baby wipes being disposed in the waste water system was documented in the first four weeks after the end of the campaign.

This campaign was distinguished by Maine to be noteworthy. In 2014, the Maine Department of Environmental Protection presented MEWEA, INDA, and the Portland Water District with an ‘Environmental Excellence’ award for this “Save Your Pipes: Don’t Flush Baby Wipes” campaign. It was noted that this campaign raised awareness of an important environmental and economic problem facing the country’s wastewater treatment facilities – the flushing of baby wipes. The United States Environmental Protection Agency (USEPA) Region 1 office similarly acknowledged these three organizations in 2014 with the presentation of an Environmental Merit Award for this project.

The collaboration was also noted as creatively seeking a solution with a public/private partnership for a widespread concern in order to protect our environment. Efforts to share the materials developed as part of this collaboration, and to inform decisions about future packaging, labeling, and marketing decisions by manufacturers, are ongoing as of the date of this report.

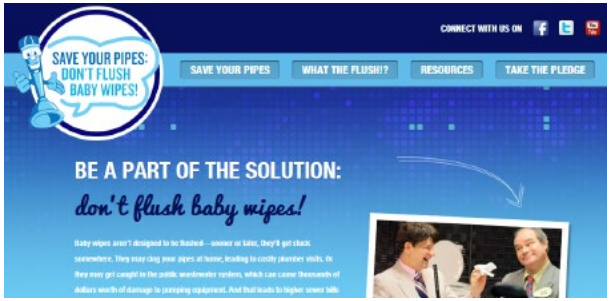
Appendix A: Quantitative measure of baby wipes before and after campaign

SUMMARY	Pre week 1	Pre week 2		Pre week 3		Pre week 4		Pre week 5	Pre week 6	
Date	10/17/2013	10/22/2013	10/24/2013	10/29/2013	10/31/2013	11/5/2013	11/7/2013	11/12/2013	11/19/2013	11/21/2013
Start time	7:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	8:00 AM	7:30 AM	7:30 AM
End time	9:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	10:00 AM	9:30 AM	9:30 AM
Total Flow	189,233	182,431	188,475	215,139	186,923	214,161	207,857	178,317	213,628	208,309
Number of Baby wipes	60	38	62	65	50	97	137	35	75	44
Tampons,Fem	73	67	79	65	69	59	64	49	62	70
Others (paper, tampon, other wipes, etc)	253	349	368	385	324	472	504	179	332	334
Other less Tampons and Baby Wipes	120	244	227	255	205	316	303	95	195	220
Total articles	313	387	430	385	374	569	641	214	407	378
% Baby Wipes	19%	10%	14%	17%	13%	17%	21%	16%	18%	12%
Baby wipes per 100K gallons	32	21	33	30	27	45	66	20	35	21
% Tampons, Fem	23%	17%	18%	17%	18%	10%	10%	23%	15%	19%

SUMMARY	Post week 1		Post week 2		Post week 3	Post week 4		Post week 5	Post week 6
Date	4/1/2014	4/3/2014	4/15/2014	4/17/2014	4/24/2014	4/29/2014	5/1/2014	5/8/2014	5/15/2014
Start time	8:00 AM	8:00 AM	8:00 AM	7:00 AM	6:00 AM	8:00 AM	12:00 AM	8:00 AM	8:00 AM
End time	10:00 AM	10:00 AM	10:00 AM	9:00 AM	8:00 AM	10:00 AM	12:00 AM	10:00 AM	10:00 AM
Total Flow	581,220	446,760	324,780	373,560	204,540	244,920	435,240	102,532	95,163
Number of Baby wipes	12	23	29	37	17	56	168	32	29
Tampons, Fem	56	-	-	-	-	71	140	84	67
Others (paper, tampon, other wipes, etc.)	238	196	216	291	86	263	539	343	337
Other less Tampons and Baby Wipes	170					136	231	227	241
Total articles	250	219	245	291	103	319	707	375	366
% Baby Wipes	4.8%	10.5%	12%	13%	17%	18%	24%	9%	8%
Baby wipes per 100K gallons	2	5	9	10	8	23	39	31	30
% Tampons, Fem	22%					22%	20%	22%	18%

Appendix B: Key elements of the campaign

- Cable TV ads,
- Local print ads/inserts,
- Website (Saveyourpipes.org),
- Social media (Facebook),
- Signs/information at Hannaford stores,
- Flyers in public restrooms,
- Sticky note on the front page of Portland Press Herald,
- Local news stories,
- Bill stuffers



Appendix C: Press Release

For immediate release

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"Save Your Pipes: Don't Flush Baby Wipes"
Improper disposal of baby wipes leads to expensive clogging issues

PORTLAND, MAINE (January 21, 2014)—For many communities across the country, the flushing of baby wipes has been a significant contributor to a serious and costly problem. Since baby wipes are not designed to breakdown in water, they can clog home drain pipes, causing messy toilet overflows and requiring expensive plumber visits to repair.

Even more serious, baby wipes can be a significant contributor to the clogging of public wastewater system equipment, which can cause sewer backups into homes and damage to equipment, costing hundreds of thousands of dollars. In addition, clogs can cause overflows which have negative impacts on the environment. The effects on sewer systems can result in dramatic increases in monthly sewer costs for homeowners.

INDA®, the Association of the Nonwoven Fabrics Industry and the Maine WasteWater Control Association (MWWCA) have partnered to address the issue with a campaign to raise consumer awareness with the theme, "*Save Your Pipes: Don't Flush Baby Wipes*". "Some products are designed to be flushed, while others are not. It is the products that are not designed to be flushed, but get flushed anyway, such as baby wipes, that are creating the problem for wastewater systems. We are working collaboratively with Maine's wastewater entities to change this," said INDA President Dave Rousse. The campaign kicked off with a press conference at the Westbrook Treatment Facility with representatives from both groups. Television commercials featuring a game show titled, "*What the Flush?!?*" will begin tomorrow to educate consumers as to what is flushable.

The Cottage Place and East Bridge Pump Stations in Westbrook serve over 6,000 businesses and homes in Westbrook, Gorham and Windham, and have seen costly repairs as a result of clogs created by baby wipes and other non-flushable products. A $4.5 million screen system was installed in 2009 to prevent clogging of pumps by baby wipes and other items that should not be flushed. "We hope the campaign will make people stop and think about what they flush, and we will see a reduction of baby wipes at these locations," said Scott Firmin, Director of WasteWater Services at the Portland Water District. **Consumers can find more information on this issue at SaveYourPipes.org, or on Facebook at facebook.com/SaveYourPipes.**

For more information, please visit SaveYourPipes.org.

SaveYourPipes.org is a project of INDA, the Association of the Nonwoven Fabrics Industry and Maine WasteWater Control Association (MWWCA) to address the growing problem of consumers flushing baby wipes. This pilot campaign is intended to educate consumers about the issue and change behavior to avoid costly repairs both in homes and public sewer systems, and serve as a model for other wastewater entities across the country.