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CASA – Wipes Collection Study

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Section 1: Introduction

1.1 Study Purpose and Overview

The purpose of the Study Report is to document the development, execution, and findings of the CASA-INDA Wipes Collection Study (Study) to meet the requirements of Assembly Bill 818 (AB 818). Part 9, Section 49652 (a) of AB 818 requires establishing a Consumer Education and Outreach Program (Program). The Study is a key input into the design of the Program to gain an understanding of consumer behavior regarding the flushing of covered products.

Through sampling events, the Study collected data from participating wastewater collection systems related to the quantity and characteristics of non-sewage materials that are being flushed into the collection system, including premoistened nonwoven disposal wipes as well as other material (e.g., clothing, toys) and sampling conditions. The data was collated and summarized for use in the design of the Program.

Kennedy/Jenks Consultants, Inc. (KJ) was responsible for designing the Study, with input from representatives from key entities, including:

- California Association of Sanitation Agencies (CASA).
- Association of the Nonwoven Fabrics Industry, which represents premoistened nonwoven disposable wipes manufacturers (INDA).
- Responsible Flushing Alliance (RFA), which will use the Study to develop the Program.

This Study Report describes the following:

1. **Collection Site Selection:** Details about the rationale and criteria for selecting specific collection sites.
2. **Procedures/Guidelines:** A description of the methodologies and guidelines developed for the execution of the Study.
3. **Study Findings:** A presentation of the findings derived from the collected data, useful for understanding consumer behavior and subsequently informing the design of the Consumer Education and Outreach Program.

1.2 Study Objectives

Based on the requirements of AB 818 and lessons learned from previous collection studies, the advisory group agreed on the following study objectives:

1. To identify and select representative treatment facilities for the Study using a survey of CASA member agencies with collection systems that have features common to collection systems throughout the State of California.

2. To use collection events at the selected representative agencies to gain an understanding of measurable consumer behavior by assessing and quantifying the types of wipes and other materials that are found in the collection system at dimensions greater than 1 inch.

Section 2: Collection Study

2.1 Summary

Two collection studies were conducted by INDA in partnership with RFA, CASA, and selected CASA member agencies: the Inland Empire Utilities Agency (IEUA) in Southern California and the Central Contra Costa Sanitation District (Central San) in Northern California. To participate in the Study, KJ selected two willing agencies that had facilities with dry weather sanitary flow over 5 MGD and vertical bar screens with rakes at the headworks. To reduce material damage and aid in sample identification, selected facilities at each agency were fed by predominantly gravity-driven networks.

Four collection events were conducted during peak sanitary flow in the dry season at the selected facilities. Two collection events were conducted at each agency. Through discussions with operations staff at both agencies, the timing of peak flows was established. At IEUA, both collection events occurred during the morning peak flow (9 AM), while at Central San, one collection event occurred at the daytime peak (12 PM) and the other at the nighttime peak (11 PM).

Samples at both facilities were retrieved from the bar screens, cleaned, and sorted. Excluding human waste, samples with dimensions exceeding 1 inch in any direction were identified using reference folders of nonwoven wipes. Samples were categorized in alignment with covered products identified in AB 818, with eight additional categories of materials included. These additional categories accounted for paper products, nonwovens that were stretched or badly damaged, and recognizable trash items such as dental floss, toys, and clothing. See Appendix A for a copy of the recorded sampling log.

A total of 1,745 articles were documented across the four sampling events, marking it as one of the largest such collection studies conducted in the United States. Table 1 shows the average distribution of articles across the four collection events, providing a comprehensive look at what Californians are flushing.

Table 1. High-level average of total materials collected – Total California (N=1,745)

Category	Percentage
Paper Towels & Non-flushable Paper Products	52.8%
Nonwoven Labeled DNF	34.1%
Feminine Hygiene	7.2%
Trash	4.9%
Nonwoven – Labeled Flushable	0.9%

The percentage of materials collected within each category had a high degree of consistency across collection events and facilities suggesting similar behavior across California. Based on this information, implementing consumer education to discourage the flushing of the top three categories could capture over 90 percent of the recovered materials.

The materials frequently found in collection and treatment systems present varying degrees of concern to the environment and wastewater infrastructure:

- Paper towels and other non-flushable paper products are generally constructed of relatively short plant-based biodegradable fibers. They are designed for good wet strength and can be recovered largely intact.
- Per the AB 818 categories, non-flushable wipes, particularly baby wipes and cleaning/disinfecting wipes may contain plastic fibers, are often of larger size (typically 40 square inches and larger), have higher tensile strength (approximately two orders of magnitude greater than paper), and significant stretch capability (up to 50%). These wipes pose a risk of clogging network pumps and causing pipe snags due to their longer fibers (up to 25 millimeter in length). Smaller non-flushable wipes (wipes for makeup removal, acne, hemorrhoid treatment, etc.) have similar characteristics.
- Feminine hygiene and menstrual care products, such as panty-liners, menstrual pads, tampons, wrappers, and applicators are thicker than paper towels and wipes, designed to resist tearing, and often contain plastic components, and are generally not designed to be flushed.
- Nonwoven wipes, labeled as flushable, are generally required to have relatively short, non-plastic fibers that can biodegrade and are designed to be relatively dispersible in water.
- Toilet tissue and facial tissue are designed with short, plant-based fibers that do not exhibit good wet strength.
- Various items of trash (toys, socks, underwear, towels, wrappers, condoms, dental floss, facemasks, etc.) are found in collection systems, as are solidified fats, oils, and greases (FOGS). All of the above-mentioned materials can agglomerate with trash and FOG to present increased risk of clogged pumps and damaged infrastructure.¹

The following sections provide insight into agency selection, Study framework, and details of the collection events.

¹ At Central San, where approximately 30 percent of the network is pumped, the Study team encountered agglomerations of FOGs, paper products, wipes, feminine hygiene, and other materials that ranged from baseball to football size. While a single paper towel or wipe presents minimal risk to a pump, the combination of these materials, and the tendency for FOGs to capture and bond these materials together, can amplify risks. Although it is outside this study's scope, attention should be given to reducing the flushing of paper towels and other non-flushable materials in addition to non-flushable wipes.

2.2 Agency Selection

A web survey of CASA member agencies was used to identify representative agencies, facilities, and locations of willing participant agencies for the Study. The survey (provided in Appendix B) consisted of a set of questions related to:

- Physical attributes of the collection system (e.g., influent flows, conveyance equipment, sewer lengths)
- Sewershed characteristics (e.g., collection area, land use types, population demographics)
- Agency interest and capacity to participate in the study
- Observations related to the frequency of wipes impacting operations
- Safety of wipes collection at available facilities

The selected agencies share features common to wastewater treatment systems across California, including wide use of gravity-fed collection systems, bar screens with ease of access for collecting samples, and flow of above 5 MGD. The bulk of the population of California is served by mid-to-large size wastewater treatment facilities, with a dry weather average flow of 5 MGD to 50 MGD. Facilities of this size generally serve mixed urban/suburban areas that capture wider demographics and flushing behavior than smaller facilities, without the distortion that can be caused by large facilities with flows above 50 MGD.

Survey questions evaluated responding agencies using questions regarding wastewater treatment plant capacity, collection system or wastewater treatment plant infrastructure type, and ragging occurrences. Eleven (11) agencies representing 14 wastewater treatment facilities responded to the survey. The survey is available in Appendix B.

Of the 11 agencies that responded to the survey, 6 volunteered to participate as a study collection site. Three (3) locations were in Northern California and three (3) locations in Southern California. Additional considerations in selecting a collection site included:

- Accessibility of screens and collection site: is there a safe and uncomplicated way to collect whole pieces of materials?
- Is there adequate space nearby to process materials?
- Is the sewershed representative of the survey respondents?

To confirm statewide flushing behavior, KJ selected one Northern and one Southern California agency from the survey respondents, one large and one medium size. Based on the results of the survey and the willingness of the agencies to participate, Central Contra Costa Sanitary District (Central San) and Inland Empire Utilities Agency (IEUA) were selected:

- Central San was established in 1946 and is located at 5019 Imhoff Pl, Martinez, CA 94553. This District serves nearly 500,000 customers. The facility has an average dry weather flow of 34 MGD.
- IEUA's Regional Water Recycling Plant No. 4 (RP-4), Headworks, 12811 6th Street, Rancho Cucamonga, CA 91739. Established in 1997, at the time of the collection event, the plant was accepting flow from approximately 50,000 connections. The facility has an average dry weather flow of 10 MGD.

2.3 Study Framework Collection Methodology

2.3.1 Procedures/Guidelines

This Study Framework Procedure was developed to prioritize safety and efficiency during the facility headworks screening collection phase. Participating agency staff were presumed to possess the necessary health and safety training and personal protective equipment (PPE) for handling the screenings. Procedures and guidelines were refined based on feedback from CASA, INDA, and the participating agencies.

Materia and Equipment Required:

- Personal Protective Equipment (PPE):
 - Goggles/safety glasses/face shields
 - Gloves
 - Safety shoes/non-slip work shoes
 - Hard hats
 - Long sleeves
 - Coverall/Tyvek suit (optional)
- 5-gallon bucket (minimum 2)
- Shallow tray (2)
- Water resistant tarp (minimum 2 - 8'x10') and anchorage
- Index cards and pens for labeling and documenting notes
- Trash picker (2)
- Tongs & Tweezers
- Folding table (1)
- Board for collection
- Heavy-duty trash bags
- Camera
- Clean water
- Cleaning wipes
- Clipboard
- Data collection Log (Appendix A)
- Reference materials
 - Treatment Plant Health and Safety Procedures
 - Wipes Samples Binder

2.3.1.1 Basic Hygiene Practices:

Basic hygiene practices were reviewed with participant agencies. The following practices were included in the Study framework:

- Wash hands with soap and water immediately after handling human waste or sewage.
- Avoid touching the face, mouth, eyes, nose, or open sores and cuts while handling human waste or sewage.
- Before eating, remove soiled work clothes and eat in designated areas away from human waste and sewage-handling activities.
- Do not smoke or chew tobacco or gum while handling human waste or sewage.
- Keep open sores, cuts, and wounds covered with clean, dry bandages.
- Remove shoes and work clothes before leaving the worksite.
- Change into clean work clothing on a daily basis.
- Wash contaminated work clothing after use.
- If human waste or sewage comes into contact with your eyes, gently flush them with safe water.

2.3.1.2 Collection Schedule

Each collection event was anticipated to occur over a three consecutive-day period:

- Day 1: Check-in, introductions, safety review, and dry-run training
- Day 2: Morning peak flow sampling and categorizing and night peak flow sampling.
- Day 3: Night peak flow categorizing and morning peak flow sampling and categorizing.

2.3.1.3 Daily Schedule

Each facility was provided its own sampling schedule for Days 2 and 3 based on peak flows.

Table 2. Collection event sampling schedules

IEUA:	Central San:
Morning Peak sampling:	Morning Peak sampling:
700: CASA/INDA arrive on-site	1000: CASA/INDA arrive on-site
700 – 900: Setup	1000 – 1200: Setup
900 – 1000: Sample collection for 1 hour or until 400 pieces are obtained.	1200 – 1300: Sample collection for 1 hour or until 400 pieces are obtained.
1000 – 1300: Rinsing, sorting, and counting of samples.	1300 – 1600: Rinsing, sorting, and counting of samples.
1300 – 1400: Cleanup	1600 – 1700: Cleanup
1400: End of morning peak sampling.	1700: End of morning peak sampling.

IEUA:	Central San:
Night Peak sampling:	Night Peak sampling:
Was not feasible given the volume of materials, automated collection, and staff is not onsite during nighttime hours as the plant is staffed only 10 hours a day.	2245: INDA arrive on-site
	2300: Sample collection for 1 hour or until 400 pieces are obtained.
	2300: End of night peak sampling.

2.3.1.4 Sample Collection and Sorting Procedure

Sample collection and recording was a coordinated effort involving three individuals, each tasked with classifying the nature of the collected items. To maintain objectivity and transparency, the recording, sign-off, and correction procedures were distributed between INDA, CASA, and the participating agencies. This collaborative approach was used to reduce bias in sample assessment.

For accurate record-keeping, detailed photographs were taken of each article alongside clear identification notes. This visual documentation served as a valuable reference point throughout the study, reducing the risk of confusion or discrepancies in recordkeeping. To facilitate the final collection photographs, a fourth individual assisted in carefully arranging the samples on designated tarps (see Figure 6).

2.3.1.4.1 Roles and Responsibilities

- **Sample Collectors:** Agency staff were responsible for pulling materials from the headworks.
- **Material Sorters:** INDA representatives sorted the materials based on appearance and comparison with samples in the Wipes Samples Binder. Agency staff supported as needed and available.
- **Recorders:** Counted the materials and documented the event, including filling out the data collection form and taking pictures and videos.
- **Observers:** Representatives from CASA, RFA and agency staff were present to observe the collection event, confer with study participants about ongoing activities, and confirm the final sample count at the end of each collection.

2.3.1.4.2 Procedure

Samples were categorized according to the following categories.

Table 3. Collection Material Categories

Code	Description
BD	AB 818 baby wipes
SCD	AB 818: bathroom cleaning wipes, toilet cleaning wipes, hard surface cleaning wipes, disinfecting wipes, general purpose cleaning wipes
HND	AB 818: Hand sanitizing wipes, antibacterial wipes
MUF	AB 818: Facial and makeup removal wipes
PCBOD	AB 818: Personal care wipes for use on the body, adult incontinence wipes, body cleansing wipes
PCFEM	AB 818: Feminine hygiene wipes
PCHEM	AB 818: Adult hygiene wipes (hemorrhoid)
MTT	Moist toilet tissue / flushable wipes
OTHER	Miscellaneous products potentially used in a bathroom setting (nail polish removal pads, magic eraser, dental floss, etc.)
PT	Paper towels / Other non-flushable paper products
AHP	Absorbent hygiene products (tampons, pantyliners, light incontinence pads, etc.)
PMW	Packaging materials/wrappers
FM	Facemasks
BMC	Bandages/medical/cotton pads
UFO	(Unidentified Flushed Object)

Participants were encouraged to handle samples with care, using proper PPE. Particles of sewage were capable of splashing into eyes, mouth, and face, and all included participants were instructed keep safety in mind. Additionally, sharp objects are sometimes found in wastewater, therefore puncture-resistant gloves were suggested. The procedure is listed below:

1. Proper PPE and equipment were to be readied and prepared for the collection event. Collection/sorting/counting areas were to be prepared.
2. Sample Collectors:
 - a. Samples were to be collected from the screening rake system at the headworks of the system.
 - i. No less than 400 samples were to be collected near each facility's peak hours for no less than one hour.
 - ii. Samples were to be pulled using the trash pickers and placed into a shallow tray with water for rinsing.
 - iii. Potable water used for rinsing was to be changed out as needed.

- b. Rinsed samples were to be transferred to a 5-gallon bucket with water to cover for transport to the sorting/counting area.

3. Material Sorters:

- a. Rinsed samples were to be emptied onto tarp.
- b. Materials were to be separated based on comparison with samples shown in Sample Wipes Binder and labeled according to agreed collection material categories as listed in Table 3.

4. Recorders:

- a. Once the collected samples were separated, findings were to be documented by taking pictures/videos and filling out the log contained in Appendix A.
 - i. A count of “1” was to be considered any material measuring one (1) inch or more in two dimensions.

5. Agency Staff:

- a. After samples were documented, samples were to be disposed of into agency-designated disposal receptacles.

2.4 Execution

2.4.1 Inland Empire Utilities Agency RP-4

Under regular operating conditions, RP-4 receives flow from two distinct regions, as illustrated in Figure 1. The “brown” region operates solely under gravity, without the assistance of pumps. In contrast, the “green” region to the south of the plant is typically pumped to RP-4 from the San Bernardino (SB) lift station. Both regions encompass approximately 47,000 service connections. For the duration of the collection study, RP-4 exclusively received gravity-fed flow from the brown region, which was delivered to the headworks via a 42-inch interceptor. This flow then entered a pair of vertical bar screens with a spacing of 1/8 inch. The peak flow during this study period occurred at 8:00 AM and reached 11 to 12 million gallons per day (MGD).

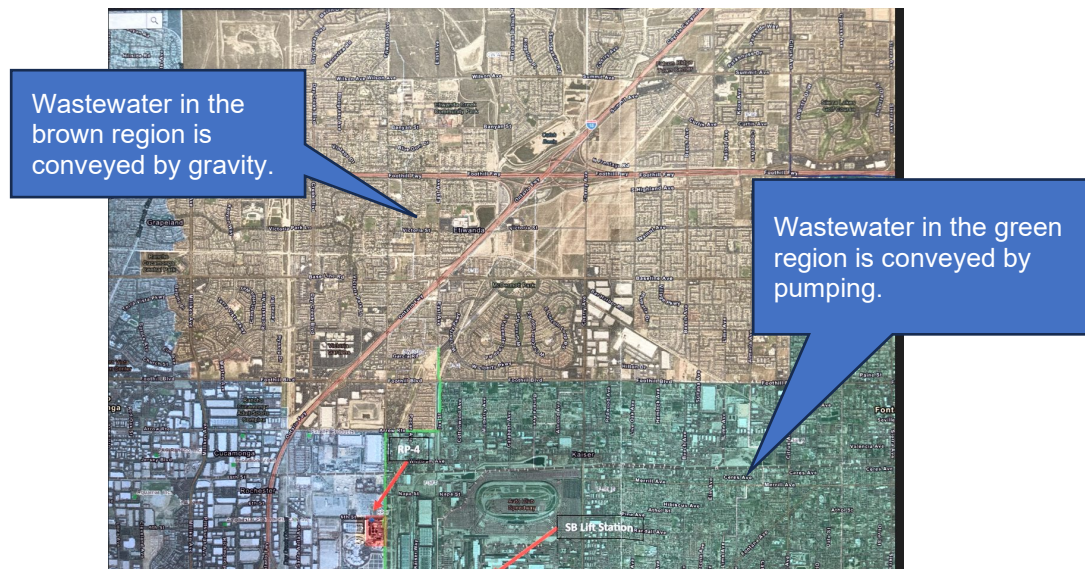


Figure 1. IEUA Sewer Shed- Interceptor Feeding RP-4 Green.

The interceptor originates North of Foothill Blvd and encompasses a subdivision of approximately 500 dwellings, including single-family homes, condominiums, and low-cost housing, all situated within a one-mile radius of RP-4. The transit times for the incoming flow, operating at rates of 2 to 3 feet per second as specified by IEUA, are likely to be less than one hour under gravity.

The screen rakes operate by gravity, directing all collected screenings through a conveyor into an auger, as depicted in Figure 2. The auger then conveys the screenings and organic matter to a washer/compactor unit, which cleans off organics and dewateres the screenings before loading the waste into a dumpster. Approximately three cubic yards of screenings are transported off-site for landfill disposal every two to three days.

Upon arriving on-site on the morning of Day 1, the INDA/CASA/RFA and IEUA team assessed the optimal methods for safely recovering screenings. They observed that the auger was causing damage to the materials entering the compactor, subsequently crushing the shredded materials into an unrecognizable material. This outcome was deemed unacceptable for the planned nighttime collection. Consequently, the team decided to abandon the nighttime collection and shift the focus to two daytime sampling collections.



Screens



Backside of screens where screenings drop onto conveyor



Auger in trough, note the wipe caught on the auger



Washer , compactor unit – note the strung out material on exit chute



Compactor removed delivering direct from auger



Material in dumpster direct from the auger without dewatering

Figure 2. Screens, screening handling at IEUA RP-4

To obtain undamaged samples, the only viable method was to collect material directly from the rakes on the front side of the screens. This process required the cessation of the automated rake operation, properly performing lockout/tag out safety procedures, opening of doors, and the removal of materials from the rakes using garbage pickers. In adherence to lockout/tag-out safety protocols, two IEUA operators performed this task, using full face shields to protect against spray droplets. They successfully accessed three full rakes, transferring the material into buckets, which were then processed by an INDA representative to clean and isolate all articles with dimensions exceeding 1 inch.

To prevent the excessive buildup of organics and screenings, which could complicate and overwhelm the cleaning operation, the rakes were run between sampling intervals. However, because the collection process required stopping the rakes, the process was not continuous. Only one screen was operational, diverting the estimated 11 MGD flow solely through the screen designated for sampling. Due to the stop-and-start nature of the rake operation that was required to obtain samples, measuring the quantity of wipes per 100,000 gallons, as achieved in smaller operations with flows around 5 MGD or less, was not feasible.



Collecting from rakes with garbage pickers



Placing screenings in tray



Rinsing screenings, removing organics, placing samples greater than 1 inch on blue tray for identification



Tray of articles for identification



Action Figure



Paper samples of unknown origin, too weak and fine to recover or identify

Figure 3. Collection, cleaning before identification

The cleaning process was consistently executed by a two-person team, with Mike Paschka leading the effort supported by Matt Koele and Matt O’Sickey (10/12 PM). Given that this team faced the highest exposure risk, they employed safety glasses, gloves, tongs, and large tweezers to handle contaminated samples. The cleaning procedure involved manipulating samples in trays and transferring all articles exceeding 1 inch into buckets for further processing at the identification station.

2.4.2 Central Contra Costa Sanitation District

With an approximate sanitary flow of 34 MGD passing through four screens, the design and layout of the screenings handling at Central San offered more accessible features than at IEUA. However, during the evening peak flow, sampling from two continuously running screens took only 10 minutes to collect six 5-gallon buckets of screenings. This yielded more than 400 articles for identification. Mike Paschka from Procter & Gamble served as the lead for collection

and cleaning at both facilities, with support from Matt O’Sickey from INDA for both collection and cleaning events at Central San.



Four (4) screens with collection chute for screenings behind and gas extraction above.



Slugs of screenings drop off a rake and flow down the chute before being captured in 5-gallon buckets with drainage holes drilled in them. Note the heavy intact organic load.



The contents were transferred to 5-gallon buckets for cleaning and sorting above the flume. Rinse water soiled with organics was returned to the flume.



The process of cleaning and collecting samples with dimensions exceeding 1 inch was a slow, arduous, and labor-intensive operation.

Figure 4. Collection

2.4.3 Identification & Recording of Sample Collection

This operation involved three individuals, each required to discern the nature of each sample. David Powling took on the responsibility at both sites for recording each article on the paper collection sheet provided by KJ. Final sign-off was obtained from a CASA representative, who was always present, as well as the participating agency representative. In cases of errors or corrections on the sheets, the incorrect entry was struck and initialed, and a new entry was filled in. All corrections underwent discussion and review with CASA, IEUA or Central San, and INDA before their sign-off on the collection sheet. Copies of the log of collected samples can be found in Appendix A.



Figure 5. Identification at IEUA Oct 12, 2023

Photographs were captured of each article on a cutting board marked with 1-inch increments and a whiteboard that identified the article number, location, and date. This photographic record was used to maintain accurate records and resolve any misidentifications. Representative photographs of collected materials are available in Appendix D.

To streamline the process of producing a final collection photograph, a third person assisted in grouping the samples on tarp according to paper, baby wipes, and other materials (e.g., other non-flushable wipes, feminine hygiene products, wrappers, etc.).

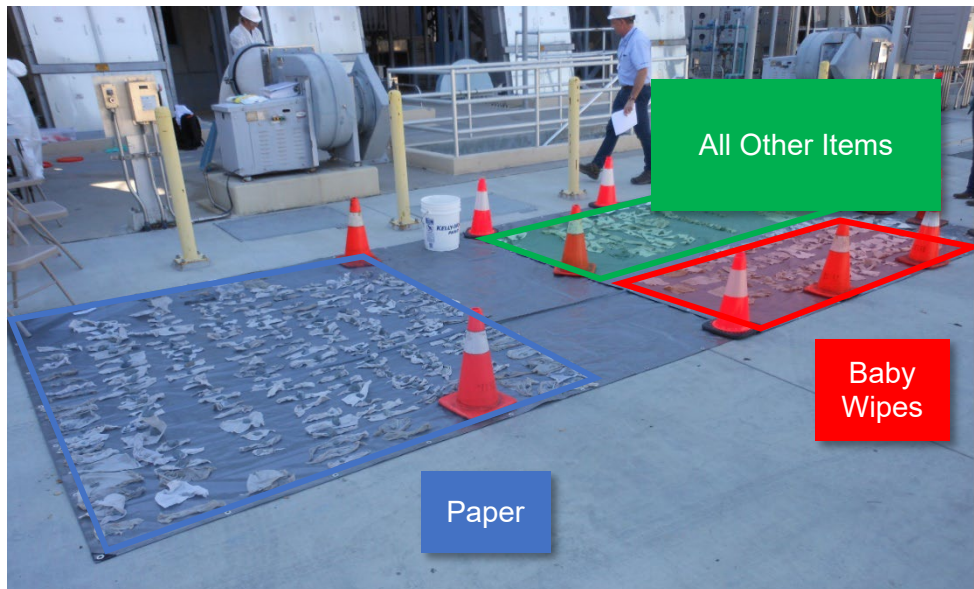


Figure 6. Tarp at the end of Central San collection 10/18/2023.

INDA assembled a sample folder of wipes readily available in California and aligned with the AB 818 category descriptions. These wipes were sourced from various outlets, including large box stores, major retailers, grocery stores, pharmacies, discount or "dollar" stores, and online retailers in California. Details regarding size, pattern, fold, and perforation of the samples can be found in Appendix C. While the identification process focused on the type of nonwoven wipe, recognizing specific brands was beyond the scope of the project and was not documented.

While no paper towels were initially included in the sample folder, a significant number of paper samples were observed early in the first collection at IEUA. Additional samples were purchased over the weekend to aid in validating identification. Paper products stand out as the cleanest category to identify; many samples were intact even though paper only exhibits low wet strength, minimal stretch, and tends to 'pop,' featuring short wood pulp fibers typically measuring 1 to 2 mm in length. Many also have distinct embossing patterns and/or printed patterns. The collection team observed paper towels – both home use and commercial type – suggesting paper towel flushing behavior is not defined by location.

Non-flushable wipes were recovered largely intact – these are the AB 818 wipes of concern. Both larger (baby wipes and disinfecting wipes – most common in recovery – and smaller non-flushables (wipes for makeup removal, acne, hemorrhoid treatment, etc.) were largely intact. While the majority of collected nonwovens were fully intact, precise identification of different nonwoven types posed challenges. The following characteristics aided in identification:

- In the folder, BD, MUF, PCBOD, and SCD samples exhibited patterns in at least 50 percent of the samples by category.
- Certain baby wipes (BD) displayed easily recognizable patterns with images, facilitating straightforward identification.
- Nearly 60 percent of the SCD samples had perforations (center-pull canister), and 40 percent of these featured dot patterns, making perforations a reliable identifier for SCD.
- BD, MUF, PCBOD, and SCD wipes all featured dot patterns.
- SCD wipes were characterized by their strength and low stretch in both directions, serving as a useful identifier.
- PCBOD wipes, being the largest, were often identified by size.
- MTT wipes were found in varying state of decomposition.
- Nonwoven wipes that had encountered a pump and became elongated or damaged were classified as UFO.

The total nonwoven wipe count, inclusive of UFOs and MTT, and the paper count should be reconciled, recognizing the potential for some discrepancies among the various categories.

Feminine hygiene products, including absorbent pads and tampons, were easily identifiable by their distinct form. These materials were recovered intact and often agglomerated with other materials.

Non-woven wipes (flushable) were not recovered intact, usually partially decomposed, with few pieces larger than 1 inch square. Toilet and facial tissue were not recoverable in pieces larger than 1 inch and were generally fully dispersed in the wastewater influent.

Section 3: Results/Conclusions

Unveiling Consumer Flushing Habits: With the identification of 1,745 articles over four days in both Northern and Southern California, this study may currently be the most comprehensive study of consumer behavior through the collection of flushed materials at wastewater treatment plants.

Comparisons and Contrasts: The Study broadly corresponds with other wipes collection studies. In comparison to the most recent Jacksonville Electric Authority (JEA) collection study in Jacksonville, Florida in 2019, the Study reveals a different distribution of materials, featuring more paper and fewer baby wipes. The presence of paper, a recurring observation in Central San, aligns with findings from the initial collection study in Moraga, California in 2010.

Meeting the Objectives: As outlined in AB 818, the Study provides the data necessary for the Program to inform the “FlushSmart” consumer education and outreach effort. Notably, one-third of all identified materials were non-woven and mandated to carry “Do Not Flush” (DNF) labels per AB 818. The DNF labelling was observed on the packaging of the reference wipe samples assembled by INDA. The next step involves linking these labels to the system impact of improper flushing, thereby educating consumers of the real-world consequences. There is an opportunity during this outreach effort to better educate consumers that in addition to wipes marked with DNF labels, feminine and adult absorbent hygiene products, paper towels and other non-toileting paper products, FOGs, and trash should not be disposed of in toilets.

Gratitude and Recognition: The successful execution of studies on this scale demands substantial planning and the commitment of time from participants. Gratitude is extended to all those who actively contributed to making this study both enjoyable and safe. Special appreciation goes to both utilities for providing secure access, operator support, demonstrating genuine interest in understanding the study and materials, and serving as exceptional hosts. Appendix A includes a list of key attendees who played integral roles in making this study possible.

The detailed count of articles on each sheet for all four collections can be found in Appendix A. A summary of the collections is presented in Table 4.

Table 4. Summary Collection Data - California Collection Studies (INDA/CASA/RFA/KJ) October 2023

Collection Material Code	IEAU – Southern California				Central San – Northern California				Summary	
	10/11/2023		10/12/2023		10/17/2023 am		10/17/2023 pm			
BD	92	18.9%	89	20.3%	69	17.0%	74	17.8%	324	18.6%
SCD	28	5.8%	29	6.6%	34	8.4%	28	6.7%	119	6.8%
HND	1	0.2%	6	1.4%	0	0.0%	1	0.2%	8	0.5%
MUF	11	2.3%	11	2.5%	2	0.5%	2	0.5%	26	1.5%
PCBOD	17	3.5%	10	2.3%	6	1.5%	9	2.2%	42	2.4%
PCFEM	3	0.6%	5	1.1%	5	1.2%	3	0.7%	16	0.9%
PCHEM	1	0.2%	5	1.1%	8	2.0%	4	1.0%	18	1.0%
MTT	0	0.0%	2	0.5%	4	1.0%	10	2.4%	16	0.9%
OTHER	27	5.6%	9	2.1%	8	2.0%	8	1.9%	52	3.0%
PT	241	49.6%	226	51.5%	218	53.8%	237	57.1%	922	52.8%
AHP	42	8.6%	29	6.6%	27	6.7%	28	6.7%	126	7.2%
PMW	9	1.9%	5	1.1%	12	3.0%	3	0.7%	29	1.7%
FM	3	0.6%	0	0.0%	1	0.2%	1	0.2%	5	0.3%
BMC	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
UFO	11	2.3%	13	3.0%	11	2.7%	7	1.7%	42	2.4%
Total Count	486	100.0%	439	100.0%	405	100.0%	415	100.0%	1,745	100.0%

Collection Materials Categories Codes and Descriptions:

BD: AB818 baby wipes

SCD: AB818: bathroom cleaning wipes, toilet cleaning wipes, hard surface cleaning wipes, disinfecting wipes, general purpose cleaning wipes

HND: AB18: Hand sanitizing wipes, antibacterial wipes

MUF: AB818: Facial and makeup removal wipes

PCBOD: AB818: Personal care wipes for use on the body, adult incontinence wipes, body cleansing wipes

PCFEM: AB818: Feminine hygiene wipes

PCHEM: AB818: Adult hygiene wipes (hemorrhoid)

MTT: Moist toilet tissue / flushable wipes

OTHER: Miscellaneous products potentially used in bathroom setting (nail polish removal pads, magic eraser, dental floss, etc.). Toys and condoms were also recorded during the study.

PT: Paper towels / Other non-flushable paper products. Shop towels were also recorded during the study.

AHP: Absorbent hygiene products (tampons, pantyliners, light incontinence pads, etc.)

PMW: Packaging materials/wrappers

FM: Facemasks. Earplugs, disposable gloves, and clothing were also recorded during the study.

BMC: Bandages/medical/cotton pads

UFO: Unidentified Flushed Object. Unrecognizable/damaged nonwoven wipes were also recorded during the study.

References

- Casey, R. 2010. Identification of Materials Entering the Moraga Pumping Station, [Master's thesis, UC Berkeley]. 23 November 2010.
- INDA. 2011. INDA /MWWCA collection study Sep 20-21 at Westbrook Pumping Station, Maine, prepared for INDA. 1 December 2011.
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- Kimberly-Clark Corporation. 2019. Forensic Evaluation of materials collected at McMillan Pump Station, Jacksonville, Florida – March 12-13, 2019, prepared for Jacksonville Electric Authority. 1 April 2019.