REMEDIATION WORKPLAN

Abandoned Composting Operation
Former Center Hill Landfill
5800 block of Este Avenue
Cincinnati, OH

Cardno ATC Project No. 72.05876.0987

Prepared For:

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APPENDICES

1.0 INTRODUCTION

Cardno ATC (Cardno) was contacted by the City of Cincinnati (the "City") regarding a former composting operation on City property that had not been properly closed by the operator prior to vacating the site. The property of concern occupies a portion of the former Center Hill Landfill, located immediately northeast of the intersection of Estes Avenue and Center Hill Avenue in the 5800 block of Este Avenue, Cincinnati, Ohio (the "site"). The site occupies approximately 10 acres on the east side of Este Avenue (see Figure 1). The City-owned property was leased to a third party for operation of a composting facility, which fell into non-compliance and was subsequently abandoned. Cardno conducted a site visit on March 27, 2014 to evaluate conditions associated with the composting operation and residual materials. This remediation workplan has been specifically developed to provide methodology to remedy such residual conditions.

1.1 Background Information

The site is a former composting operation that was not operated properly and subsequently abandoned. As a result, piles of immature compost with variable amounts of solid waste remain scattered throughout the site. A retention pond in the northwestern portion of the site was designed to capture stormwater runoff (including leachate from the stockpiled materials) in the western portion of the site. Pond contents are pumped to a nearby sanitary sewer as necessary.

Operations subsequently expanded to the eastern portion of the site without appropriate stormwater/runoff control. The City created a bermed area with transfer pumps to capture runoff from this area, in response to communication with OEPA. The pumps transfer runoff to the landfill's leachate pump station, and eventually, a combined sewer in Elmwood Place.

Initial evaluation of remedial options for the residual compost materials included off-site disposition as solid waste and/or re-use of materials at other facilities. Such alternatives were cost-prohibitive. The most cost-effective and efficient remedial approach identified to address the residual compost materials was to continue the composting process and use post-treatment materials as cover for the site. The purpose of this workplan is to provide a specification for safely and effectively managing the remaining material left on site as compost, in general accordance with OEPA requirements (Ohio Administrative Code [OAC] 3745-560) for composting facilities.

1.2 Site Description

The former Center Hill Landfill site is a capped, controlled solid waste landfill that was leased to a third party for composting activities. The portion of the landfill occupied by the compost operations consists of approximately 10 acres on the east side of Este Avenue. The Mill Creek flows south along the east side of the site. Topography at the site slopes generally to the north. It has been estimated that approximately 40,000 cubic yards (CY) of compost material in varying stages of processing remain on-site. The materials and estimated quantities include:

- Compost materials
    - Approximately 8,300 CY immature compost in two large piles (one on each side of the main access road as shown in Figure 1),
    - Approximately 20,000 CY of immature compost spread across the western and southern portions of the site,
    - Approximately 1,200 CY of mulch (immaturely composted), and
    - Approximately 130 CY finished, mature compost
- Construction waste (compostable)
    - Approximately 8,400 CY of drywall paper staged on the top of the slope on the southern portion of the site,
- Solid waste (potentially non-compostable)
    - Approximately 3,100 CY of sausage casings staged on the eastern portion of the site, and
    - 275 CY (estimated) of solid waste that will be removed during processing.

1.3 Purpose and Organization

The purpose of this workplan is to provide a specification for implementing the remedial approach for the site. The approach is to safely complete the compost procedure that was initiated by the previous operator while mitigating impacts to the adjacent surface water from site runoff.

Composting requires aerobic conditions to properly degrade wood, paper, and other organic materials. Odors from composting are generally a result of aerobic decomposition processes turning anaerobic (oxygen deprived), thereby spurring the growth of microorganisms that release sulfur, methane and other noxious gases. Presently at the site, compost materials are predominantly fine particles in large piles that are likely not supporting aerobic conditions. The result is poor degradation of the organic material in the piles, resulting in the production of noxious odor.

A preliminary objective is to ensure adequate protection of surface water during remedial activity, supplementing existing controls implemented by the City. The primary objective is to re-process and re-stage the materials on-site to enhance aerobic digestion. The intent is to compost the remaining materials on the site, then spread the finished product across the property and/or utilize the compost on other City property.

Cardno will act as the agent of the City of Cincinnati in performing such activities under our existing term contract. Subcontractors will include laboratories, waste transport and disposal (non-compostable solid waste), equipment rental, and support facilities.

2.0 REMEDIAL OBJECTIVES

2.1 Project Approach and Remedial Design

Site contour data will be reviewed in association with remedial activities and existing berms modified as appropriate to ensure adequate runoff control. Such modifications will ensure complete capture of run off/leachate from residual compost materials, and keep such runoff from entering the Mill Creek. To the degree feasible, it will be our intention to redistribute compost materials and perform grading activities (without disturbance of the landfill cap) such that runoff from all of the materials drains to the existing retention pond.

The remedial plan is to process, blend and/or amend the existing materials at the site to support aerobic composting processes. Residual materials on the site include:

- Yard waste (primarily wood),
- Dry wall paper,
- Finished, composted material,
- Food packages (sausage casings), and
- Solid waste.

The general plan is to re-process the materials as outlined below.

1. Spread the material over the site to a depth of no more than 2 feet,
2. Hand remove any plastic, metal, or other solid wastes,
3. Blend site materials,
4. Supplement the material by adding Urea (if necessary to achieve optimum C:N ratio), and
5. Re-stage into smaller wind rows to allow for aerobic digestion.

Based on the materials present at the site and the intended amendments, work will be performed in general accordance with requirements specified for a Class II Composting facility (OAC 3745-560-200).

Material to be composted will be characterized in general accordance with OAC 3745-560-225. A total of five composite samples will be collected, with each composite sample representing less than 10,000 CY (per regulatory requirements).

Each composite sample will consist of nine grab samples collected from three depths at three equally spaced areas of each pile of materials to be characterized. Split spoon sampling devices will be utilized to obtain samples from various depths. For the material spread across the site, the area will be divided into 18 equal grids and one grab sample obtained from the central portion of each grid. Grab samples from each area being characterized will be thoroughly mixed in a stainless steel mixing bowl in the field, and a minimum of two quart jars of composite sample submitted for laboratory analysis.

The dry wall paper on-site is readily compostable, but it is not feasible to compost this material without mixing with the compostable wood materials. Therefore, the 8,400

cubic yards of dry wall paper will be mixed with the approximately 30,000 of compostable materials presently spread and piled on the site. Thus, each composite sample from these materials will have a representative portion of the dry wall paper (one part dry wall paper to 4 parts compostable material) added to represent the actual material that will be mixed, amended, and placed into wind rows for composting. The existing mulch and mature compost will also be addressed in this manner (one part mulch/compost to 30 parts compostable material).

The sausage casings on the site have a paper and plastic component. However, the biodegradable nature of the casings on site has not as yet been accurately determined. Therefore, a separate sample of the casings will be sent for testing. Since this material is less than 10% of the total volume of material on site, and it's assumed a portion of the casings will be biodegradable, it is Cardno's intent to mix the casings with the wood and paper waste proportionally, as discussed above for the dry wall paper, prior to amending and placing in wind rows for composting. However, if the material is deemed non-biodegradable and/or is not approved by the OEPA as "alternative material", then the casings may have to be managed as a solid waste.

Composite samples will be sent to an approved laboratory and analyzed for parameters as outlined in OAC 3745-560-230. This analysis will support the project by identifying any hazardous constituents, pathogens, and also determine the additive ration for Urea needed to achieve the optimum C:N ratio. The analysis will also help determine whether the sausage casings can be effectively managed on-site.

2.2 Remedial Action Objectives

Remediation objectives for the site are three-fold:

- Control storm water runoff and ensure leachate capture,
- Odor control prior to and during compost processing, and
- Completion of the composting process and reuse of compost on-site for erosion control (or on other City property).

The following specific elements will be implemented to achieve the remedial objectives:

- Ensure the areas of the site in which material will be staged are graded to a minimum of 1% slope and a maximum of 6% slope (OAC 3745-560-202) so as to direct surface water to the existing storm water pond and/or to other areas of accumulation (without disturbance to the landfill cap);
- Sample and analyze the various site materials to determine additive of Urea ratio needed to achieve optimum C:N ratio and to determine viability of other materials for compost operations;
- Spread material, amend with Urea (as needed) add dry wall paper and/or sausage casings, and restage into smaller, more efficient wind rows;
- Monitor the piles for temperature on a weekly basis;
- Re-spread and re-stage (agitate, aerate, amend) as needed until maturity is achieved; and

- Test the final materials using the same compositing and sampling process as performed for the initial characterization to confirm maturity.

2.3 Action Levels

Occupational Safety and Health Administration regulations regarding exposure to compounds are not applicable to this project. The action levels for this project are the acceptable parameters for metals, pathogens, and compost maturity per OAC 3745-560-230.

The ultimate action level is achieving mature compost, which can be visually observed by the black color and non-septic odor. Once Cardno has determined visually that maturity has been achieved, testing will be performed utilizing Test Methods for Examination of Composting and Compost (TMECC) to verify maturity. Methods 05.08 for oxygen uptake, carbon dioxide evolution rate, or others will be utilized.

3.0 HEALTH AND SAFETY

Remedial activities will be performed in a manner that is protective of human health and the environment.

3.1 Health and Safety Plan

An environmental health and safety plan (HASP) for the project will be prepared and implemented in accordance with 40 CFR 1910.120. The plan will be based upon a review of previous assessment data from the site. The HASP will outline environmental hazards, recommended personal protective equipment, and other procedures. Remedial activities will be performed in accordance with HASP requirements and all personnel will be required to comply with the HASP.

Tailgate meetings will be held at the beginning of each work shift to emphasize project health and safety, specific hazards of the areas to be entered, and work objectives for that period.

A Site Health and Safety Officer (SHSO) will be designated who is responsible for ensuring that the HASP is implemented and that work practices are conducted in a safe manner. In the event that odors, staining or unusual conditions are encountered on-site (beyond those as previously observed/quantified), work in that area will be halted until the area can be appropriately investigated.

All personnel entering the exclusion zone (i.e., the area of remedial excavation) will be required to review, sign and follow the HASP. Personnel working in the exclusion zone will be required to have 40-hour Occupational Safety and Health Act (OSHA) training (with annual refreshers) per 29 CFR 1910.120. All visitors to the excavation area must be instructed about the hazards of on-site activities and must sign a Visitor's Log.

3.2 Odor Control/Suppression

Compost odors can be a significant nuisance to the public in the areas surrounding and down-wind of the site. The process of spreading, tilling and placing material into wind rows will expose fresh compost surfaces and result in significant odor production. However, once the process is oxygen rich and not anaerobic, and as the compost matures, the odors should be significantly decreased. Therefore, after the first processing and establishing of the proper composting ratios, subsequent turning of the wind rows should not generate nearly the odor as the during the initial processing of the materials. In addition, the Urea product used to obtain the optimal C:N ratio (25 to 30:1) will help mitigate odors.

4.0 REMEDIAL ACTIVITIES

4.1 Preliminary Design

Stormwater conditions at the site will be evaluated as follows:

- Existing GIS data (provided by the City) will be used to evaluate storm water flow on the site;
- Based on initial review of the above data, additional data will be obtained and/or surveying of the site will be performed to accurately map storm water flow directions on the site to identify the water shed managed by the existing retention pond;
- Evaluate the pond capacity to ensure its capability to effectively manage storm water;
- Design storm water controls for the site to ensure complete capture of runoff with no impact to Mill Creek.

4.2 Storm Water improvements

Based on findings from the above analysis, stormwater controls will be designed and placed to ensure effective management of stormwater and associated leachate associated with the residual compost materials. Materials processing/amendments will not be performed until adequate stormwater controls are verified. Site conditions will be modified as necessary to ensure that such conditions comply with OEPA regulations (Chapter 6111 of the Ohio Water Pollution Control Act). Such modifications may include (but are not limited to): berms/diversion trenches, additional storm water collection areas, and/or moving materials so they are within the capture zone of the existing retention pond.

4.3 Odor Control

The primary source of odor is the anaerobic conditions presently on the site due to anaerobic degradation of the compost piles. Therefore, promoting aerobic digestion with spreading, smaller wind rows, mixing with bulking agents, obtaining optimal C:N ratios, and other techniques should serve to minimize odors as part of the long-term compost process.

However, it is likely that the process of aerating the site materials will expose highly anaerobic areas of compost materials, thereby resulting in a significant increase in the noxious odors emanating from the site. Thus, prior to the destruction of the existing compost piles, steps will be taken to control/limit odors.Dilute hydrogen peroxide will be spray-applied to existing compost piles to promote aerobic conditions prior to deconstruction. Hydrogen peroxide will also be spray-applied during pile deconstruction as fresh surfaces of compost materials are exposed.

The effectiveness of odor control will be qualitatively evaluated in the field. Additional odor control measures may be undertaken as feasible, including but not limited to:

- Use of an enzymatic catalyst spray to destroy odors over the materials and around the site continuously while handling the immature compost material,
- Placing a biofilter layer over the piles to degrade odors emanating from the piles (biofilter can be grass clippings, shredded yard waste, cured compost and other materials spread over the pile 6" deep), and
- Forced aeration of the piles with blowers, piping, and other mechanical means that encourage aerobic digestion and also control odors by pulling air through the wind row into a controlled air handling system.

4.4 Site Control

The site presently has a fence that is capable of controlling unauthorized access. Site control measures also include reducing insects, birds, rodents, and other pests (vector control) throughout the operation.

Wind rows to be constructed will not provide a natural habitat for rodents/mammals as there is little to no open space. In addition, the temperature will reduce the likelihood of nesting.

Standing water will be controlled by pumping/discharge to the sanitary sewer, thereby minimizing insect issues associated with stagnant water.

4.5 Remediation

Residual compost materials will be addressed through completion of the compost/degradation and beneficial reuse process. The remedial process will begin with physical segregation of solid waste (plastic bags, cans, other trash) from exposed surfaces of materials currently stockpiled and spread across the site. Such materials will be placed in roll-off boxes on-site for future off-site disposition as solid waste at a licensed municipal waste landfill. This process will continue throughout materials handling as fresh surfaces within the compost materials are exposed.

Once the solid waste is removed to the degree feasible, a proportionate amount of the construction waste, mulch/mature compost and/or the sausage casings will be spread across the site as determined based on original characterization data. The goal is to create a homogenous mixture of all site compostable material so once composting is complete, the finished material will be of consistent quality and consistency. Materials will be mixed using front-end loaders and spread with a dozer. Composting of the sausage casings is contingent upon acceptable characterization results to ensure its treatability. If the casings are deemed not amenable for composting, then they will be managed as solid waste.

Once all visible solid waste is removed and other site materials are added, Urea product amendment will be added as needed to obtain the optimal Carbon: Nitrogen ratio (30:1).

Based on visual examination, amendment is expected due to insufficient Nitrogen in the material. The compost materials stored on site are predominantly brown, with no fresh or "green" material (grass clippings, fresh tree cuts, etc.) present. These green materials are usually the source of nitrogen in an effective compost operation. Urea will be applied as a liquid using hand held agricultural sprayers. The personnel removing the solid waste will also apply the amendment.

Once amendments and other site materials have been added, the material will be mixed, turned, and generally manipulated to thoroughly mix and aerate. This will be done in combination with the Dozer, front-end loader, and a skid steer equipped with a 65" tiller attachment.

Once the material is mixed, it will be placed into wind rows approximately 10' tall, and 10' wide at their base. This should be sufficiently small to allow for aerobic conditions. Since there is very little bulk material (large wood or other compostable material that increases void space) on the property, small wind rows are necessary. The challenge with smaller wind rows is finding adequate space for the increased quantity. The intent is to place the wind rows constructed from the material presently spread across the site as far to the west and north on the property as possible. This may require some of the material being moved prior to final placement into wind rows. The wind rows will be constructed by the dozer with support from the front-end loader.

Once the material presently spread across the site is placed into the wind rows, the existing piles will each be deconstructed and spread westward and managed as stated above (solid waste removed via hand-picking, other site materials added, amendment added, mixed/tilled, then moved and placed into wind rows). The pile to the west of the main access road will be managed first, followed by the pile to the east of the main access road. Wind rows will be constructed parallel to the slope of the site to make sure storm water runoff flows parallel to the wind rows towards the storm water control structure(s).

The access road will likely be part of the compost staging area once all materials are placed into wind rows. Approximately 20 feet of space will be provided between each wind row to ensure sufficient space is maintained between wind rows to allow for the row to be spread out for aeration, as needed. In addition, the area for processing all wind rows will be placed in conformance with the requirements specified in OAC 3745-560-400 with regards to proximity to surface water.

In summary, the remediation process will be as follows:

- Spread piled material westward over the site to a maximum depth of 2 feet;
- Hand-pick solid waste from the material;
- Apply additional site materials (compost, casings, construction materials) to the spread material in the appropriate ratios;
- Apply Urea amendment at the appropriate amount and ratio;
- Mix, turn and aerate with dozer, loader, and skid steer with tiller attachment; and
- Transplant the material to an area of the site with adequate space (if necessary) and construct small wind rows parallel to the slope of the site.

4.6 Monitoring and Post-Remediation Operations

Once placed in wind rows, the piles need to be frequently monitored for temperature. The optimum temperature range for composting is between 130 and 160 degrees Fahrenheit. It's critical the temperature does not go below 130 degrees, and to avoid over-heating and potential combustion of the wood product, no pile should exceed 180 degrees. This optimal temperature range also promotes destruction of harmful pathogens that are commonly in wood and other compostable materials.

It is recommended the piles be monitored for temperature daily until the optimal temperature is achieved. Once achieved, the temperature will be monitored at least weekly. Given results to ensure optimal C:N ratio, there is a very small likelihood of fire from overheating. If temperature readings are consistent for 4 to 6 weeks of monitoring, frequency will be reduced to monthly.

Monitoring will be performed utilizing a long probe thermometer (4' minimum) to access the middle of the wind rows. Measurements will be obtained from the surface (approximately 12" deep in the pile) and in the middle (approximately 4' deep in the pile.) At the initial stages, monitoring should be performed every 100 linear feet on each compost wind row. As data demonstrates no variation across a wind row, the frequency can be reduced to eventually both ends and the middle of each wind row.

While monitoring, the technician will log the temperature, visual conditions, and any odors at each monitoring location (see data sheet for field monitoring, attached). The technician will be familiar with methane and sulfur odors associated with anaerobic conditions, and will document any such odors. In the event concurrent monitoring events demonstrate anaerobic conditions, the area of the wind row should be aerated via oxidizing chemical addition (dilute hydrogen peroxide), forced air, or deconstructed and reconstructed.

Once per month, a sample will be collected from the middle of each wind row. The sample will be visually inspected for color, odor and consistency and the results logged. In addition, the moisture content (by feel) will be recorded. The material should be moist enough to clump when squeezed, but no free liquids should emerge. If the clump breaks apart when the hand pressure is released, then the material is too dry.

Each wind row will be turned on a quarterly basis until finished compost is produced. This turning involves deconstructing the wind row by spreading, adding amendments or water, if necessary, then replacing into a new wind row.

If monitoring indicates low temperature, low moisture, and/or anaerobic conditions, the piles will be reconstructed during a turning event and piping introduced at that time to allow for aeration. Perforated agricultural drainage piping will be placed in the middle of each wind row during reconstruction. For wind rows constructed at less than 200 feet in length, one 6" diameter run of this flexible piping could be placed long wise in the wind row with the open ends of the piping sticking out at both ends of the wind row. Longer wind rows would be constructed utilizing transverse sections of the perforated piping to increase aeration. This piping will provide natural aeration by creating open space for air

flow. The heat of the wind row will generate a natural flow which may be sufficient to maintain an aerobic environment. If not, blowers can be attached to the ends of the perforated piping to force aeration. If blowers are utilized, they will be installed to pull vapors form the pile to pull ambient air through the wind row. Pulling the vapors will also support odor control efforts.

Whether or not the use of blowers is warranted, monitoring would then be performed by measuring the air temperature in the piping, moisture in the air, and even sulfur and methane in the air stream managed by the perforated piping. The other advantage of this approach is that the wind rows can be constructed larger (taller and wider) since aeration is provided by the piping. This approach may also reduce the need for quarterly turning and thereby, reduce cost in the long run. If blowers are used to force aerate, it can also greatly increase the composting process and therefore, the time required to achieve maturity.

4.7 Recordkeeping

Records of operation will be maintained utilizing OAC 3745-560-04 and 3745-560-215 as guides. From the planning and design phase through the completion of the composting (until all material is either beneficially reused on site or other City property), processes will be monitored and records maintained, including photographic documentation.

Specific information to be logged includes:

- Method of composting, equipment utilized, materials combined, amendments added,
- Temperature and other monitoring data as discussed in section 4.5,
- Volume of solid waste removed and disposed,
- Documentation and photos of any unauthorized materials found during materials handling (batteries, asbestos, hazardous waste, construction debris, etc.) including date, time and location of discovery, and
- Product testing information, including sampling dates, times, methodology, and analytical results.

4.8 Site Restoration

Once field observations indicate the composting operations have resulted in mature compost, Composite samples will be collected as described in section 2.1 and analyzed for parameters specified in OAC 3745-560-230. However, analytes not identified in the original characterization data will be eliminated from the analytical spectrum. Once the material is tested and deemed mature and acceptable for use as fill on-site and/or for use on other City property, material will be spread accordingly.

The retention pond will be drained of residual liquids (pumped to sanitary), and graded with the remainder of the site. The site will then be seeded and strawed to promote vegetative cover.

5.0 SCHEDULE AND IMPLEMENTATION

The project schedule shall be approved by the City, upon OEPA approval of this workplan.

5.1 Tentative Schedule

The project is tentatively scheduled to be initiated July 7, 2014. The project schedule is outlined below by task.

Task	Start Date	End Date	Duration (weeks)
Preliminary Activities: storm water control evaluation/design, preliminary odor control application and initial pre-remedial sampling/analysis	7/07/14	8/18/14	6
Construct storm water controls	8/18/14	9/01/14	2
Composting operations	9/1/14	10/1/14	4
Post-remediation monitoring and operations	10/1/14	1/1/15	12
Testing, spreading of remaining material, demobilization, site clean-up	1/1/15	1/8/15	1
Final report preparation and submittal	1/8/15	2/8/15	4

The schedule is subject to change, pending weather conditions and other unforeseen circumstances.

5.2 Working Hours and Noise Controls

Standard working hours for the exploratory excavation and remediation activities will be 7:00 AM to 4:00 PM, Monday through Friday.

5.3 Field Variances

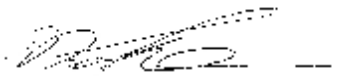
Variances from the work plan will require approval by the City prior to any action being taken except for emergencies (when an immediate response is required). The above parties shall be notified if an emergency response is implemented. The field variances will be documented in the final report prepared for the project.

6.0 PROJECT DOCUMENTATION

A report will be prepared at the completion of remedial activities to document post-remedial site conditions. The report will include a description of methodology, waste manifests, data summary tables, figures, copies of laboratory reports, field monitoring data, photographic documentation, and firm conclusions/recommendations regarding post-remedial conditions at the site. The report will be used to certify closure of the facility pursuant to OAC 3745-560-235 and compliance with OAC 3745-27-13 (Rule 13 Permit).

7.0 SIGNATURE OF ENVIRONMENTAL PROFESSIONALS

This workplan was prepared by Cardno on behalf of the City of Cincinnati. The workplan has been prepared in accordance with sound science/engineering and methodology as outlined herein, and is in general accordance with standard industry practices and applicable regulatory protocols.



Mike Kinder
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DESIGNED:	SMH
DRAWN:	SMH
CHECKED:	MK
DATE:	6/4/2014
SCALE:	1 " = 300 '
FILE NO.:	CARD125 Fig 1- Site Map.mxd
PROJECT NO.:	CARD125
OFFICE LOC.:	ASHLAND

NO.	DATE	REVISION

300' 0 300'

1 " = 300 '

CITY OF CINCINNATI
FORMER CENTER HILL LANDFILL FACILITY
CINCINNATI, HAMILTON COUNTY, OHIO

SITE MAP

FIGURE #
1

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Compost Facility Field Monitoring Form
Pile or Windrow ID: _____

Point A:_____ **Point B:_____** **Point C:_____** **Point D:_____** **Point E:_____** **Point F:_____**

Date	Process Day	ID (initials)	Outside Temp.	Time	Depth	Compost Temperatures						Notes (turning events, moisture conditions/adjustments or odors)
						A	B	C	D	E	F	
					12”							
					48”							
					12”							
					48”							
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