New York City MSW Composting Report

Appendix D
New York City Institutional/Commercial/Industrial Organic Waste Composting Economic and Technical Viability Final Report

Report by City Green, Inc.

New York City
Institutional/Commercial/Industrial Organic Waste Composting
Economic and Technical Viability

Research & Development Project
Contract No. C003333

Final Report
December 2001

Prepared for
Environmental Services Unit
Empire State Development

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Research & Development Project - Contract No. C003333
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New York City Institutional/Commercial/Industrial Organic Waste Composting Economic and Technical Viability

I. Summary of Findings and Conclusions

The project identified proven, drum-based compost technologies, and demonstrated their capacity to produce Class I compost from New York City industrial, commercial and institutional (ICI) waste, with minimal modification to existing waste collection methods. The project further identified potential compost markets that could absorb the output of a commercial-scale compost facility in NYC, and showed that such a facility, under certain favorable conditions, could offer a tipping fee competitive with existing alternative disposal options. Nevertheless, the difficulty in obtaining long term contracts for waste will make the financing of such a facility highly problematic. In addition, the private carter collection fee structure established by the City currently discourages the development of high organic content (heavy) collection routes, creating an additional obstacle to obtaining the desired waste stream. It is likely that, as with other commercial-scale facilities surveyed during the project, the development of composting capacity for NYC ICI organics will depend on a guarantee of tonnage from the City, i.e., a guaranteed baseline tonnage of residential and/or institutional waste from the NYC Department of Sanitation. This guarantee, combined with changes to the collection fee structure so that collectors of heavy waste are not penalized, could result in the development of a facility at which additional capacity could be added for ICI organics.

II. Changes to Work Plan

The original proposal called for conducting compost trials using demonstration-scale, mobile drum-based composting equipment, which was intended to represent a commercial-scale operation. However, during the course of the Project, it became possible to conduct composting trials at an actual operating drum-based composting facility in Marlborough, MA. This change to the original work plan was greatly beneficial with respect to our Learning Targets, providing the opportunity to conduct the trials under real world conditions.

III. Task-by-Task Report

The Project had two Learning Targets:

Target #1 - Determine the effectiveness of drum composting technology in processing various NYC ICI waste streams for recovery of organic materials. This was achieved by generating the

data needed to answer the following questions:

A. How suitable for composting are the various ICI waste streams that are available in NYC, i.e., what is the moisture content, C:N ratio and % physical contaminants.

B. What quality of compost is produced from composting different ICI waste streams using a drum composter coupled with curing and screening.

C. What are the physical and chemical properties of the compost and how do they compare with regulatory and agronomic requirements and local and regional markets for compost products?

Target #2 - Determine the economic viability of a full-scale drum-based composting facility for private and public sector investors/developers in NYC. This was achieved by answering the following questions:

A. What type (and quantities) of potentially suitable waste might be available for a facility located in NYC, compared to the system size required to achieve economies of scale (e.g., 250 to 500 tons per day)?

B. What are the current and projected costs for recycling/disposal alternatives (including collection costs) compared to projected costs for tipping waste at a full-scale composting facility (including assumptions for residue disposal and compost sales)?

C. What opportunities exist for long term contracts that would facilitate facility financing?

Target #1

The primary task involved in addressing Target #1 was to conduct composting trials at a commercial scale composting facility that employs a drum-based technology. Trials took place at the Bedminster-Marlborough, LLC (BM) facility located in Marlborough, MA. A description of the BM facility is presented in **Attachment A**.

For the project, the New York City Department of Sanitation arranged for the BM facility to dedicate the use of one drum (the BM facility has two drums) and appropriate space within the facility to process NYC ICI material separately and keep it segregated from all other activities at the plant. Prior to loading the ICI material, the designated digester was purged of waste (a small amount of compost material remained to serve as an inoculant). During a period of five consecutive days (3/12/01- 3/16/01), ICI material was trucked from the Bronx to the BM facility, where it was loaded into the dedicated drum. A total of 305 tons (approximately 60 tons per day) of ICI waste were processed through the facility.

The ICI waste was taken from four collection routes operated by Isabella City Carting Corp. Waste characterization data from a 1997 study conducted at Metropolitan Transfer Station (MTS), where Isabella Carting brings its loads for transfer and export, was used in route selection. Based on the 1997 study and discussions with MTS and Isabella Carting, four high organic content routes were identified. **Attachment B** shows the make-up of the four selected routes by waste generator type. Combined, the four routes had 375 stops, 254 (68%) of which were high organic content waste generators (restaurants, food retail and hotels). Since these generators tended to produce more and/or heavier waste than other generators on the routes, it is estimated that high organic content waste generators accounted for more than 85% of the combined weight of the four routes.

As described in **Attachment A**, material received at the BM facility is initially sorted manually, and later mechanically screened to remove contaminants. At each stage where contaminants are removed, weight data for both compost and contaminant fractions was obtained in order to create a mass balance as the material flowed through the BM facility, over the course of 41days. The total residue or contaminant rate was approximately 30%, with one half of that comprised of designated recyclable materials (metal, glass and plastic). Approximately 20% of the residue consisted of film plastic, a large fraction of which is assumed to be inevitable, given the use of plastic bags for waste collection. The balance of the residue (approximately 30%, or 10% of the entire processed ICI waste stream) consisted of non-recyclable metal and plastic, wood, textiles and miscellaneous inert materials. Mass balance and contaminant (residue) characterization data is contained in **Attachment C**.

Protocol was developed for sampling and lab testing of the composting material during the composting process at the BM facility and throughout additional curing stages at Woods End Research Laboratory (WERL). All sampling of the ICI compost material at the BM facility was performed by City Green and samples were shipped directly to WERL for testing and additional curing. Lab results are contained in **Attachment D**, and summarized in **Section IV** below.

In addition to conducting composting trials with ICI waste at the BM facility, a survey was conducted of four operating, commercial-scale, drum-based composting facilities (including the BM facility). Data from these surveys was used to provide a broader picture of the economic and technical performance of drum-based composting systems in the U.S. and Canada. Facility surveys are contained in **Attachment A**.

Target #2

The primary tasks in support of Target #2 were gathering relevant economic data and performing life cycle economic analyses for two scenarios for a drum-based compost facility located in NYC. The full economic analyses are presented in **Attachment E**. The results of the economic investigation are summarized in **Section IV** below.

IV. Conclusions

Based on the results of the compost trials, data gathered from the facility surveys, existing NYC waste composition data and other information, the following conclusions can be drawn:

- The NYC ICI waste stream contains substantial amounts of compostable materials that could be accessed with minimal modification to existing collection methods;
- Drum-based composting technologies are suitable for composting this material and producing a Class I compost product; and
- A facility employing drum-type composting technology could be competitive with alternative export and landfilling costs.

Nevertheless, a significant obstacle to the development of a commercial-scale compost facility for ICI waste is the lack of availability of long term contracts committing any given waste stream. In addition, the City's current system for regulating commercial waste collection discourages the development of concentrated, wet, high-organic content routes. These obstacles and other project conclusions are described in greater detail below.

A. Quantities & Suitability for Composting of NYC ICI Waste

As described above, ICI waste for the composting trials undertaken at the BM facility was obtained through selection of specific routes known to be high in organic content. This was done in part because the short duration of the project made it impractical to establish new source-separation programs for organics. However, of equal or greater importance, this approach was taken because it represents a realistic method for future collection of ICI waste for a commercial-scale compost facility. In other words, through selective routing, a highly compostable waste stream could be collected from ICI sectors without additional collection costs.

The residue rate from the composting trials undertaken in this project was approximately 30%. This rate is comparable to the normal residue rate experienced at the BM facility and at the other commercial-scale facilities surveyed in this project. However, this rate could be substantially reduced through more careful routing (i.e., not collecting from certain generators), and through effective source-separation programs for mandated recyclables. Characterization of the residue showed that approximately 50% of it is composed of recyclables. In addition, there were materials that one would not expect to see if only high-organic content generators were part of the collection route. Consequently, it is not unreasonable to assume that a residue rate of 15% could be achieved with very modest changes to the current ICI collection system, and that of that 15%, close to half would be comprised of film plastic that is used in the collection process, and so is arguably not a contaminant, but instead a necessary by-product of the collection system.

ICI organics composted at the BM facility displayed close to optimal properties for composting, including a moisture content of 58.9% to 59.4% and a C:N ratio of 24.6 to 26.1. (Property data was obtained from digested ICI organics after discharge from the drum and formation into the initial windrow.)

According to existing waste composition data, the ICI sector generates approximately four million tons of solid waste a year. Of this, 1.2 million tons (or 30%) is generated by sectors that are considered have a high organic content waste stream. The table below summarizes waste generation and composition data for these sectors. It should be noted that generators from these sectors represented approximately 85% (by weight) of the four NYC commercial collection routes used in the composting trials undertaken during the project.

NYC High-Organic Content ICI Waste Generators (1)

Sector	Annual Generation (tons)	% Compostable (2)	Annual Generation of Compostables (tons)
Eating & Drinking Establishments	721,711	50-80	360,855 to 577,368
Food Stores	432,718	40-85	173,087 to 367,810
Hotels	61,569	50-75	30,784 to 46,176
Total	**1,215,998**		**564,726 to 991,354**

(1) Data from NYC DOS 1992 waste composition study.
(2) Figures vary depending on amount of paper included as "compostable" vs. recyclable.

The composting trials undertaken in this project demonstrated that high-organic content ICI waste suitable for drum-based composting can be obtained with minimal modifications to current NYC collection methods. And, as the figures above show, the quantities of ICI waste produced in NYC provide many possibilities for the creation of collection routes targeting organic waste.

B. Compost Quality & Markets

The following tables provide relevant data on the quality of the compost produced during the course of the trials. The first table provides New York State Department of Environmental Conservation Standards (6 NYCRR Part 360) for Class I compost, along with test results from two samples of compost derived from NYC ICI waste produced at the BM facility. Each compost sample was a composite, taken from composted material after screening through a 3/8 inch screen, 133 days after initial loading of the drum. The timing of the screening and sampling was dictated by the Carbon-to-Nitrogen ratio (C:N), as it correlates to compost stability. The product would be acceptable for soil blending and a variety of other end-uses at a much earlier, less mature stage. However, at day 133, the compost was considered to be a fully mature product usable in any permitted application.

The second table provides data on the agronomic properties of the compost that was produced from ICI waste during the course of this project. The samples tested were taken from the same screened, 133 day-old compost as was used for testing of regulated characteristics, as described above. For purposes of comparison, agronomic properties are also provided for a "Quality Garden Compost."

Compost Quality - Regulated Characteristics

Parameter (1)	NYS DEC Part 360	Sample A	Sample B
Mercury	10	1.4	1.1
Cadmium	10	4.8	4.0
Nickel	200	31.2	32.8
Lead	250	88.0	68.4
Chromium	100	36.4	32.8
Copper	1000	116.0	124.0
Zinc	2500	424.0	492.0
PCBs	1	<1	<1
Particle Size	<10mm	<10mm	<10mm

(1) Except where noted, all figures are for allowable concentrations in parts per million (ppm) dry weight.

Compost Quality - Agronomic/Horticultural Properties

Property	Survey Sample A	Survey Sample B	Standard (1)
Moisture, % of Saturation	79	88	35-85
Organic Matter (% of total solids)	60.9	58.7	20-75
Density (lbs/cu.yd.)	994	1146	600-1200
Total Nitrogen, % of total solids	2.8	2.8	1.0-4.0
Phosphorous (P), % of total solids	0.18	0.18	0.1-1.0
Potassium (K), % of total solids	0.32	0.34	0.1-2.0
pH	7.7	7.6	5.5-8.0
Conductivity/Salinity (mmhos/cm)	8.4	7.7	2-13
C:N	11	11	10-30
Solvita Maturity Index	6	6	6-8

(1) Standard for "Quality Garden Compost", as established by WERL.

Based on the compost properties described above, one would expect a facility processing ICI

high-organic loads to produce a Class I compost. The following table lists some of the potential markets for a Class I compost product in the NYC area. Market figures were taken from the NYC Department of Sanitation's 1992 Comprehensive Solid Waste Management Plan for New York City. In the Plan, "low" and "high" ranges for potential compost markets in the NYC area were developed. The following table uses the more conservative "low range" figures.

Potential Compost Markets in the NYC Metropolitan Area

Market	Cubic Yards/Year
Public Sector	
NYC Parks & Recreation	69,150
NYC Housing Authority	36,500
NYC Shade Tree Commission	2,800
NY/NJ Port Authority	110,250
NY Department of Transportation	2,250
NYC Sanitation & Area Landfills	1,180,700
Subtotal (public sector)	**1,401,650**
Private Sector	
Landscapers	49,300
Nurseries	56,600
Golf Courses	7,300
Soil Dealers	75,000
Sod Farmers	97,500
Cemeteries	11,000
Mine Reclamation	14,000
Subtotal (private sector)	**310,700**
Total	**1,712,350**
Adjustment for double counting	87,000
Total	**1,625,350**

Assuming the above market conditions are even remotely accurate, the potential outlets for a Class I compost in the NYC area are substantial. The following information (figures in cubic yards) places the expected compost output from a 300 ton per day (tpd) compost plant in the context of these potential market figures:

- Compost from a 300 ton per day facility 45,000 per year
- "Low Range" potential NYC area markets 1,625,350 per year
- "Low Range" potential markets (public sector only) 1,401,650 per year

For a 300 tpd facility, which was the basis for the economic analyses included in this report, a total market share of less than 3% would be required, or a slightly more than a 3% share of public sector purchases. At "High Range" market potential estimates, the output of a 300 ton per day plant would equal slightly more than 1% of the total market, and less than 2% of public sector purchases.

C. Economic Feasibility

An economic feasibility analysis was performed, based on two different scenarios. Both scenarios assume that the facility processes 300 tpd of ICI material. A 300 tpd capacity was selected because: a) It is a point at which certain economies of scale are reached; b) It is comparable to the capacity of other, operating, commercial-scale drum-based composting systems; c) It is a quantity that presumably could be easily diverted from the ICI waste stream; and d) It would generate a quantity of compost that could presumably absorbed by the NYC area market with relative ease.

Both scenarios assume collection costs for this material are the same as those for regular ICI solid waste, and that high-organic content is achieved at no additional cost by a combination of selective routing and the institution of effective source-separation programs for mandated recyclables. However, the scenarios differ in several ways that affect the tipping fee. Scenario one is a non-optimal scenario, whereas scenario two is based on favorable conditions. The following table highlights the different assumptions used for each scenario, as well as the resulting tip fees. It should be noted that the majority (approximately $29) of the tipping fee differential between the two scenarios can be attributed to the higher cost of capital in the private ownership and financing scenario (Scenario 1).

NYC ICI Compost Facility Scenarios

Variable	Scenario 1	Scenario 2
Residue Rate	30%	15%
Land	Purchase @ $250,000/acre	Provided by the City @ no cost
Compost Sales	$0 value	$15 per ton
Residue Disposal	$75/ton	$65/ton
Ownership/Financing	Private	Public
Tip Fee (per ton)	**$105**	**$55**

The facility survey undertaken during the project included identifying the tip fee charged for commercial waste at existing drum-based compost facilities was identified. A number of factors affect the tipping fee at each of these facilities. For example, they each vary in: the quantities of solid waste and biosolids they handle; ownership arrangements; the extent to which private capital was required for site acquisition and construction; and their municipal contractual relationships. Consequently, it is difficult to compare them to directly to the scenarios developed for a facility in New York City. Nevertheless, the rates these facilities charge for commercial waste do provide additional points for comparison with NYC commercial transfer station tip fees as of the end of 2001. These various tip fees are shown in the table below.

Tipping Fees By Facility

Facility	Tip Fee
Scenario 1	$120
Scenario 2	$55
Bedminster Marlboro	$70 to $85 *
Conporec	$45 (Canadian) *
Dano	$45 *
NYC Transfer Stations (end of 2001)	$57 to $80

* As noted, there are a number of factors that make these tip fees higher or lower than the hypothetical scenarios.

Based on tipping fees charged by the commercial-scale operating facilities in North America surveyed over the course of the project, and the analyses performed for two hypothetical facilities, a 300 tpd facility for ICI high-organic waste could be competitive with competing disposal alternatives, assuming certain favorable conditions. Nevertheless, there remain major obstacles to the financing of a facility for ICI material. These include:

- The difficulty of obtaining long term contracts for guaranteed tonnages. Current regulations guiding the private carting industry allow waste generators to break any hauling contract with 30 days notice. This effectively prohibits waste haulers from having a guaranteed waste stream.

- The City's rate structure establishes maximum rates that private haulers can charge waste generators, based on volume. Haulers pay to tip their loads at a transfer station based on weight. As a result, heavy, wet waste is the least profitable to collect. It is anticipated that a collection route targeting organic waste would result in a waste stream with a bulk density of between 500 and 1000 pounds per cubic yard, without compaction. The current maximum allowable charge per un-compacted cubic yard is $12.20. Thus, the most a waste hauler could charge for collection and disposal of concentrated, high organic waste would be between $24.40 and $48.80 per ton. Thus, even the maximum allowable charge is below the current tipping fee at commercial transfer stations and

below the anticipated tip fee at a hypothetical compost facility, under either scenario (i.e., using favorable or unfavorable assumptions).

In summary, the project identified proven drum-based compost technologies, and demonstrated their capacity to produce a Class I compost from NYC ICI waste, with minimal modification to existing collection methods. The project further identified potential compost markets that could easily absorb the output of a commercial-scale facility in NYC, and showed that such a facility, under certain favorable conditions, could offer a tipping fee that is competitive with existing alternative disposal options. Nevertheless, the difficulty in obtaining long term contracts for waste make the financing of such a facility highly problematic, and current private carter collection regulations discourage the development of routes that are high in organic content.

While most of the compost facilities surveyed during the course of the project process ICI waste, this material is, by and large, obtained on the spot market (i.e, without long term contracts). For each of these facilities, the basis for financing was a committed residential waste stream, obtained from the local municipality(s). It is likely that, as with the commercial-scale facilities surveyed, the development of composting capacity for NYC ICI organics will depend on a guarantee of tonnage from the City, i.e., a guaranteed baseline tonnage of residential and/or institutional waste from the NYC Department of Sanitation. Typically, municipal put-or-pay contracts that are tied to new facility development, guarantee waste for a period of 15 to 20 years. Such a guarantee, combined with changes to the collection fee structure so that collectors of heavy waste are not penalized, could result in the development of a facility at which additional capacity could be created for ICI organics.

ATTACHMENT B

Bedminster-Marlborough Composting Trials

NYC ICI Waste Data By Generator

Route # 589A			
Category	**# of stops**	**% of route by weight (1)**	**tonnage to compost trials**
Restaurants	40	44	32.93
Food Retail	4	25	18.71
Hotels	1	20	14.97
Non-food Retail	15	5	3.74
Offices	4	6	4.5
subtotal	**64**	**100**	**74.85**
Route # 589B			
Category	**# of stops**	**% of route by weight (1)**	**tonnage to compost trials**
Restaurants	40	71	38.44
Food Retail	1	15	8.12
Hotels			
Non-food Retail	15	10	5.41
Offices	2	4	2.17
subtotal	**58**	**100**	**54.14**
Route # 590			
Category	**# of stops**	**% of route by weight (1)**	**tonnage to compost trials**
Restaurants	65	49	32.3
Food Retail	12	25	16.48
Hotels	1	4	2.64
Non-food Retail	20	12	7.9
Offices	30	10	6.59
subtotal	**128**	**100**	**65.91**
Route # 118			
Category	**# of stops**	**% of route by weight (1)**	**tonnage to compost trials**
Restaurants	75	66	72.49
Food Retail	15	25	27.46
Hotels			
Non-food Retail	25	5	5.49
Offices	10	4	4.39
subtotal	**125**	**100**	**109.83**
Summary			
Category	**# of stops**	**% of total weight (1)**	**tonnage to compost trials**
Restaurants	220	57.81	176.16
Food Retail	32	23.22	70.77
Hotels	2	5.78	17.61
Non-Food Retail	75	7.40	22.54
Offices	46	5.79	17.65
TOTAL	**375**	**100**	**304.73**
(1) Estimated by route operator, Isabella City Carting Corp.			

ATTACHMENT C
Mass Balance and Residue Characterization Data

NYC ICI Drum Composting Trials									
Mass Balance Data									
(all weights shown in tons)									
(% based on weight)									
	Received at BM scale	Front-end residue	Material into drum	Primary 2" screen unders	Primary 2" screen overs	Secondary 1/2" screen unders	Secondary 1/2" screen overs	Final 3/8" screen unders	Final 3/8" screen overs
3/12/01	62.45	2.61	59.84						
3/13/01	59.00	2.36	56.64						
3/14/01	61.95	2.62	59.33						
3/15/01	60.14	2.70	57.44	39.20	8.30				
3/16/01	61.19	1.72	59.47	65.52	17.36				
3/17/01				45.40	10.33				
3/19/01				39.92	7.41				
3/20/01				47.52	9.18				
4/21/01						162.74	26.54	156.07	6.67
Total	**304.73**	**12.01**	**292.72**	**237.56**	**52.58**	**162.74**	**26.54**	**156.07**	**6.67**
% of tons received	100.00	3.94	96.06	77.96	17.25	53.40	8.71	51.22	2.19

Mass Balance	tons	%
Total Residue	97.80	32.1%
Loss of Mass	50.86	16.7%
Material to Curing	156.07	51.2%
Total	304.73	100%

ATTACHMENT C
Mass Balance and Residue Characterization Data

NYC ICI Drum Composting Trials										
Characterization of Residue										
(all weights shown in tons)										
(% based on weight)										
Category	Front-end residue (1) (weight)	Overs at 2" screen (weight)	Overs at 2" screen (%)	Overs at 1/2" screen (weight)	Overs at 1/2" screen (%)	Overs at 3/8" screen (weight)	Overs at 3/8" screen (%)	Total residue (weight)	Total residue (%)	% of total ICI waste processed
Glass				15.92	60	4.82	72.3	20.74	21.21	6.81
Film Plastic		14.02	26.67	6.05	22.8	0.65	9.8	20.72	21.19	6.80
Recyclable Plastic (2)		10.5	19.97					10.5	10.74	3.45
Recyclable Metal (3)		15.65	29.76					15.65	16.00	5.14
Other Plastic (4)		2.59	5.66	2	7.5	0.59	8.8	5.18	5.30	1.70
Other Metal (5)		2.98	4.92	0.66	2.5	0.09	1.3	3.73	3.81	1.22
Textiles		2.62	2.37			0.02	0.3	2.64	2.70	0.87
Wood		1.24	4.98	0.93	3.5	0.16	2.4	2.33	2.38	0.76
Misc. Inert		2.18	4.14	0.48	1.8	0.34	5.1	3	3.07	0.98
Misc. Organic		0.8	1.52	0.5	1.9			1.3	1.33	0.43
Unsorted (1)	12.01							12.01	12.28	3.94
Total	**12.01**	**52.58**	**99.99**	**26.54**	**100**	**6.67**	**100**	**97.8**	**100.00**	**32.09**

(1) Front-end residue was weighed but not characterized. Based on visual observation, the following are the primary constituents: metal (pipes, tanks, frames and shelving), electronic equipment, glass bottles, auto parts, wooden and plastic crates and film plastic.

(2) HDPE (pails & bottles) and PET

(3) primarily bi-metal cans

(4) primarily container caps, flexible tubing, polypropylene and PVC

(5) primarily aerosol cans and auto related waste (old parts and oil filters)

Attachment D

NYC ICI Waste Compost Trials Testing Results

Bedminster Marlboro Composting Pilot

ICI PROJECT
City Green

data presented by:

Woods End
Research Laboratory
INCORPORATED

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Account: 556
· attn: Venetia Lannon
· DOS Waste Prev. Reuse and Recycling
· 44 Beaver Street-8th floor
· New York NY 10004

Code: CScyvdx Project: 605
Date Received : 07/27/2001
Date Reported : 09/18/2001
Lab ID Number : 5035.2
Quality Checked : WO 9/19/01

COMPOSITION ANALYSIS

Sample Identification: Compost: NCI Day 133 WERL Cure, Sample A

VARIABLE MEASURED	Unit	dry basis	as is basis	Notations †
DENSITY	$lbs{\cdot}ft^3$	-	37	994 lbs/yd^3
Solids	%	100.0	47.4	948 lbs/ton
Moisture	%	0.0	52.6	126 gals/ton
est. water holding capacity	%	192	66	158 gals/ton
Inert and Oversize Matter	%	~	3.1	62.0 lbs/ton
pH (paste, H_2O)	$-logH^+$	~	7.72	MedHigh
Free Carbonates (CO_3)	Rating	~	3	V High
Volatile Organic Acids	ppm	422	200	M Low
Organic Matter	%	60.9	28.9	577 lbs/ton
Conductivity	$mmhos{\cdot}cm^{-1}$	~	8.4	Med-High
Carbon:Nitrogen (C:N) Ratio	w:w	11.7	11.7	M. Low
Respiration Rate/day	C% of Total-C	0.27	0.27	-
Carbon loss per day	% of total weight	0.09	0.04	0.9 lbs/ton
Dewar Self-Heating	°C rise	~	1	Grade V
Seedling Response Assay, Percent of Control				
Lepedium sativum Germination	%	~	100	No Phytotoxicity
Lepedium sativum Weight	%	~	79	Good
Solvita CO_2 Rate	(see chart)	~	6	Med-Low
Solvita NH_3 Rate	(see chart)	~	5	Absent
Maturity Index	(see chart)	~	6	Active-Curing

Notes: ppm = mg/kg < = less than MLD (minimum level of detection), nd = none detected

†For explanation of data, see Woods End Laboratory Interpretation Sheet

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MINERALS ANALYSIS

Sample Identification: NCI Day 133 WERL Cure, Sample A

VARIABLE MEASURED	Unit	dry basis	as is basis	pounds/ton *as is*
Total Mineral Nutrients				
Total Nitrogen	%	2.809	1.331	26.6
Organic-Nitrogen	%	2.742	1.299	26.0
Phosphorus (P)	%	0.184	0.087	1.7
Potassium (K)	%	0.324	0.154	3.1
Sodium (Na)	%	0.540	0.256	5.1
Calcium (Ca)	%	4.400	2.086	41.7
Magnesium (Mg)	%	0.380	0.180	3.6
Soluble Nutrients				
Ammonium-N (NH_4-N)	ppm	11	5	0.0
Nitrate-N	ppm	663	314	0.6
Nitrite-N	ppm	<2	< 1	nd
Chloride (Cl)	ppm	5952	2821	5.64
Sulfate (SO_4-S)	ppm	2883	1367	2.73

Notes: ppm = mg/kg < = less than MLD (minimum level of detection); nd = none detected

Woods End Research Laboratory, Inc.
Old Rome Road, P.O. Box 297
Mount Vernon, ME 04352/USA
207-293-2457 FAX: 207-293-2488 www.woodsend.org

Account: 556
attn: Venetia Lannon
DOS Waste Prev. Reuse and Recycling
44 Beaver Street-8th floor
New York NY 10004

Code: CScyvdx-Project: 605

Date Received : 07/27/2001
Date Reported : 09/18/2001
Lab ID Number : 5035.2

METALS ANALYSIS

Sample Identification: NCI Day 133 WERL Cure, Sample A

VARIABLE MEASURED	Unit	dry basis	as is basis‡	pounds/ton *as is*
Copper (Cu)	$mg \cdot kg^{-1}$	116.0	55.0	0.1
Manganese (Mn)	$mg \cdot kg^{-1}$	408.0	193.4	0.4
Iron (Fe)	$mg \cdot kg^{-1}$	3080.0	1459.9	2.9
Zinc (Zn)	$mg \cdot kg^{-1}$	424.0	201.0	0.4
Lead (Pb)	$mg \cdot kg^{-1}$	88.0	-	-
Chromium (Cr)	$mg \cdot kg^{-1}$	36.4	-	-
Cadmium (Cd)	$mg \cdot kg^{-1}$	4.8	-	-
Nickel (Ni)	$mg \cdot kg^{-1}$	31.2	-	-
Arsenic (As)	$mg \cdot kg^{-1}$	2.4	-	-
Mercury (Hg)	$mg \cdot kg^{-1}$	1.4	-	-
Molybdenum (Mo)	$mg \cdot kg^{-1}$	2.93	-	-
Selenium (Se)	$mg \cdot kg^{-1}$	1.8	-	-
BACTERIOLOGIC ANALYSIS				
Fecal coliform EPA503	MPN per g	< 2	-	
Total *Salmonella* EPA503	MPN per 4g	< 1.7	-	

Notes: $mg\ kg^{-1}$ = ppm (parts per million); MPN = most probable number
< signifies *less than MLD* (minimum level of detection) for the particular factor tested
‡ = EPA reporting requires dry basis only

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Account: 556
· attn: Venetia Lannon
· DOS Waste Prev. Reuse and Recycling
· 44 Beaver Street-8th floor
· New York NY 10004

Code: CScyvdx Project: 605
Date Received : 07/27/2001
Date Reported : 09/18/2001
Lab ID Number : 5035.3
Quality Checked : WO 9/19/01

COMPOSITION ANALYSIS

Sample Identification: NCI Day 133 WERL Cure, Sample B

VARIABLE MEASURED	Unit	dry basis	as is basis	Notations †
DENSITY	lbs·ft^3	-	42	1146 lbs/yd^3
Solids	%	100.0	42.3	846 lbs/ton
Moisture	%	0.0	57.7	138 gals/ton
est. water holding capacity	%	186	65	156 gals/ton
Inert and Oversize Matter	%	~	7.1	142.0 lbs/ton
pH (paste, H_2O)	-logH^+	~	7.66	MedHigh
Free Carbonates (CO_3)	Rating	~	3	V High
Volatile Organic Acids	ppm	709	300	M Low
Organic Matter	%	58.7	24.8	496 lbs/ton
Conductivity	*mmhos*·cm^{-1}	~	7.7	Med-High
Carbon:Nitrogen (C:N) Ratio	w:w	11.2	11.2	M. Low
Respiration Rate/day	C% of Total-C	0.40	0.40	-
Carbon loss per day	% of total weight	0.13	0.05	1.1 lbs/ton
Dewar Self-Heating	°C rise	~	1	Grade V
Seedling Response Assay, Percent of Control				
Lepedium sativum Germination	%	~	98	No Phytotoxicity
Lepedium sativum Weight	%	~	65	Fair
Solvita CO_2 Rate	(see chart)	~	6	Med-Low
Solvita NH_3 Rate	(see chart)	~	5	Absent
Maturity Index	(see chart)	~	6	Active-Curing

Notes: ppm = mg/kg < = less than MLD (minimum level of detection), nd = none detected

†For explanation of data, see Woods End Laboratory Interpretation Sheet

Woods End Research Laboratory, Inc.
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Account: 556 Code: CScyvdx–Project: 605

attn: Venetia Lannon
DOS Waste Prev. Reuse and Recycling
44 Beaver Street-8th floor
New York NY 10004

Date Received : 07/27/2001
Date Reported : 09/18/2001
Lab ID Number : 5035.3

MINERALS ANALYSIS

Sample Identification: NCI Day 133 WERL Cure, Sample B

VARIABLE MEASURED	Unit	dry basis	as is basis	pounds/ton *as is*
Total Mineral Nutrients				
Total Nitrogen	%	2.819	1.192	23.8
Organic-Nitrogen	%	2.758	1.167	23.3
Phosphorus (P)	%	0.180	0.076	1.5
Potassium (K)	%	0.348	0.147	2.9
Sodium (Na)	%	0.620	0.262	5.2
Calcium (Ca)	%	4.040	1.709	34.2
Magnesium (Mg)	%	0.276	0.117	2.3
Soluble Nutrients				
Ammonium-N (NH_4-N)	ppm	22	9	0.0
Nitrate-N	ppm	585	247	0.5
Nitrite-N	ppm	<2	< 1	nd
Chloride (Cl)	ppm	5130	2170	4.34
Sulfate (SO_4–S)	ppm	2382	1008	2.02

Notes: ppm = mg/kg < = less than MLD (minimum level of detection), nd = none detected

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· 44 Beaver Street-8th floor
· New York NY 10004

Code: CScyvdx-Project: 605

Date Received : 07/27/2001
Date Reported : 09/18/2001
Lab ID Number : 5035.3

METALS ANALYSIS

Sample Identification: NCI Day 133 WERL Cure, Sample B

VARIABLE MEASURED	Unit	dry basis	as is basis‡	pounds/ton *as is*
Copper (Cu)	$mg \cdot kg^{-1}$	124.0	52.5	0.1
Manganese (Mn)	$mg \cdot kg^{-1}$	444.0	187.8	0.4
Iron (Fe)	$mg \cdot kg^{-1}$	4480.0	1895.0	3.8
Zinc (Zn)	$mg \cdot kg^{-1}$	492.0	208.1	0.4
Lead (Pb)	$mg \cdot kg^{-1}$	68.4	-	-
Chromium (Cr)	$mg \cdot kg^{-1}$	32.8	-	-
Cadmium (Cd)	$mg \cdot kg^{-1}$	4.0	-	-
Nickel (Ni)	$mg \cdot kg^{-1}$	32.8	-	-
Arsenic (As)	$mg \cdot kg^{-1}$	2.7	-	-
Mercury (Hg)	$mg \cdot kg^{-1}$	1.1	-	-
Molybdenum (Mo)	$mg \cdot kg^{-1}$	2.74	-	-
Selenium (Se)	$mg \cdot kg^{-1}$	1.6	-	-
BACTERIOLOGIC ANALYSIS				
Fecal coliform EPA503	MPN per g	< 2	-	
Total *Salmonella* EPA503	MPN per 4g	< 2	-	

Notes: $mg \cdot kg^{-1}$ = ppm (parts per million); MPN = most probable number
< signifies *less than MLD* (minimum level of detection) for the particular factor tested
‡ = EPA reporting requires dry basis only

WOODS END RESEARCH LABORATORY

Will Brinton
Box 297
MT VERNON ME 04352

Project: NYC-DOS

Certificate of Analysis

PCB's Method EPA 8082

Sample:	4910.1	Analyte	Result	Units	PQL
Collect Date:	4/23/2001	PCB 1242	ND	mg/Kg	0.2
Date Received:	4/25/2001	PCB 1254	ND	mg/Kg	0.2
Lab Sample #	01X0395-01	PCB 1232	ND	mg/Kg	0.2
Date Analyzed	5/2/2001	PCB 1260	ND	mg/Kg	0.2
Date Extracted	4/25/2001	PCB 1248	ND	mg/Kg	0.2
Surrogate(DCB) % Recovery	66.4 AR 30-150	PCB 1016	ND	mg/Kg	0.2
g Sample Extracted	Percent Solids 51.7	PCB 1221	ND	mg/Kg	0.2
Wt Basis	Dry wt Basis				
PCB 1260 Spike Amount (mg/Kg)					

Sample:	4910.2	Analyte	Result	Units	PQL
Collect Date:	4/23/2001	PCB 1242	ND	mg/Kg	0.2
Date Received:	4/25/2001	PCB 1254	ND	mg/Kg	0.2
Lab Sample #	01X0395-02	PCB 1232	ND	mg/Kg	0.2
Date Analyzed	5/2/2001	PCB 1260	ND	mg/Kg	0.2
Date Extracted	4/25/2001	PCB 1248	ND	mg/Kg	0.2
Surrogate(DCB) % Recovery	75.8 AR 30-150	PCB 1016	ND	mg/Kg	0.2
g Sample Extracted	Percent Solids 46.2	PCB 1221	ND	mg/Kg	0.2
Wt Basis	Dry wt Basis				
PCB 1260 Spike Amount (mg/Kg)					

Laboratory Supervisor 5/23/01

PQL Practical Quantitation Limit
PCB Report

ND Not Detected (<PQL)
Page 1 of 1

WOODS END RESEARCH LABORATORY

Will Brinton
Box 297
MT VERNON ME 04352

Project: NYC-DOS

Certificate of Analysis

Total Metals - Method EPA 6020/200.8

Sample Name:	4910.1	**Analyte**	**Result**	**Units**	**PQL**	**Method**
Sample Location:		Arsenic	1.0	mg/Kg	1.000	EPA 6020
Sampling Date:	4/23/2001	Mercury	0.9	mg/Kg	0.1000	EPA 7471A
Sampling Time:	14:00	Molybdenum	2.0	mg/Kg	1.000	EPA 6020
Date Received:	4/25/2001	Selenium	ND	mg/Kg	1.000	EPA 6020
Lab #:	01X0395-01					
Matrix:	SOIL					
Analysis Date:	5/2/2001					
% Solid:	51.7					

Sample Name:	4910.2	**Analyte**	**Result**	**Units**	**PQL**	**Method**
Sample Location:		Arsenic	1.1	mg/Kg	1.000	EPA 6020
Sampling Date:	4/23/2001	Mercury	1.5	mg/Kg	0.1000	EPA 7471A
Sampling Time:	14:00	Molybdenum	2.7	mg/Kg	1.000	EPA 6020
Date Received:	4/25/2001	Selenium	ND	mg/Kg	1.000	EPA 6020
Lab #:	01X0395-02					
Matrix:	SOIL					
Analysis Date:	5/2/2001					
% Solid:	46.2					

Lab Supervisor: _____

Report Date: 23-May-01

ND Not Detected PQL Practical Quantitation Limit Metals Report Page 1 of 1

Attachment E

Life Cycle Financial Analyses

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 1: PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

12-Jan-02

ASSUMPTIONS:

Capital Costs:			**Development Equity: First 6 Mos. of Proj Devel.**	**Second 6 Mos. of Proj Devel.**	**Upon Proj. Fin. $000**	**deprec. per. (Years)**
Initial Marketing, RFP Response			$25,000			
Final Marketing, Prel Eng., Pricing & Contracting				$30,000		
Final Eng. & Des., Permitting & Dev. of Proj. Financing				$300,000		
Project Financing & Construction: ($000)						
Equip (Including 2 digest.)					$12,500	10
100,000 SF Bldg @	$70	per SF			$7,000	28
Biofilters					$3,000	28
5 Acre Site @	$250,000	per Acre plus 12% site improvement			$1,400	
Perf. Guarantee @10%					$1,250	28
Int Dur. Const (18 Months)					$1,000	28
Borrower's Counsel					$50	28
Conting.& spare pts @ 10%					$1,250	28
Debt Res. Fund					$2,636	
Financing:						
Placement Fee @ 3% assumes non rated debt					$762	
P. Agent's Counsel					$50	
Issuer's fee @ 1%, if required					$254	
Bond Counsel					$50	
Feas. Opin.					$125	
Trustee					$50	
Cusip, printing & Other					$50	
Financial Advis.					$75	
Other			$0	$0	$250	28
SUB TOTAL			$25,000	$330,000	$31,752	
TOTAL					$32,107	
Financing Assumptions:						
Debt (%/Amt)			0%	0%	80%	$25,401
Equity (%/Amt)			100%	100%	20%	$6,705
Total Capital						$32,107
Avg. % Equity					20.88%	
Debt Term					20	years
Debt Rate					8.25%	

Operating Costs (000):		**Ann. Esc. Ra**	**/MSW Ton**
O&M Cost + R&R Cost	$2,400	3.00%	$26.67
2,000,000 kwh/yr $0.120	$240	3.00%	
Other (DSRF Int. @ 3.0%)	($79)	0.00%	($0.88)
Res. Disp. @ $75/T, 30%ICI	$2,025	3.00%	$22.50
TOTAL	$4,586		$50.95

Throughput:	**TPD**	**DPY**	**TPY**
ICI	300.00	300	90000

Fees per ton:

ICI Tip Fee (w/ Res Disp)	$105.00	3.00%
Sold Compost Rev (FOB Plnt)	$0.00	1.50%

Financial Results:

10 Year IRR	18.05%
20 Year IRR	24.56%

Debt Cov. Ratio:	
Year 1	0.97
Avg. Yr. 1-10	2.12
Avg. Yr. 1-20	2.54

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 1: PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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12-Jan-02

Year	1	2	3	4	5	6	7	8	9	10
Revenues:										
ICI Tons	90000	90000	90000	90000	90000	90000	90000	90000	90000	90000
ICI Tip Fee	$105.00	$108.15	$111.39	$114.74	$118.18	$121.72	$125.38	$129.14	$133.01	$137.00
ICI Revenue	$9,450,000	$9,733,500	$10,025,505	$10,326,270	$10,636,058	$10,955,140	$11,283,794	$11,622,308	$11,970,977	$12,330,107
Compost Tons (50%ICI)	45000	45000	45000	45000	45000	45000	45000	45000	45000	45000
Rev/T	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Compost Revenue	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Revenue	$9,450,000	$9,733,500	$10,025,505	$10,326,270	$10,636,058	$10,955,140	$11,283,794	$11,622,308	$11,970,977	$12,330,107

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 1: PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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12-Jan-02

Year	11	12	13	14	15	16	17	18	19	20
Revenues:										
MSW Tons	90000	90000	90000	90000	90000	90000	90000	90000	90000	90000
MSW Tip Fee	$141.11	$145.34	$149.70	$154.20	$158.82	$163.59	$168.49	$173.55	$178.76	$184.12
MSW Revenue	$12,700,010	$13,081,010	$13,473,440	$13,877,644	$14,293,973	$14,722,792	$15,164,476	$15,619,410	$16,087,992	$16,570,632
Compost Tons	45000	45000	45000	45000	45000	45000	45000	45000	45000	45000
Rev/T	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Compost Revenue	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Revenue	$12,700,010	$13,081,010	$13,473,440	$13,877,644	$14,293,973	$14,722,792	$15,164,476	$15,619,410	$16,087,992	$16,570,632

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 1: PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

Year	21	22	23	24	25	26	27	28	29	30
Revenues:										
MSW Tons	90000	90000	90000	90000	90000	90000	90000	90000	90000	90000
MSW Tip Fee	$189.64	$195.33	$201.19	$207.23	$213.44	$219.85	$226.44	$233.24	$240.23	$247.44
MSW Revenue	$17,067,751	$17,579,784	$18,107,177	$18,650,393	$19,209,904	$19,786,201	$20,379,787	$20,991,181	$21,620,917	$22,269,544
Compost Tons	45000	45000	45000	45000	45000	45000	45000	45000	45000	45000
Rev/T	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Compost Revenue	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Revenue	$17,067,751	$17,579,784	$18,107,177	$18,650,393	$19,209,904	$19,786,201	$20,379,787	$20,991,181	$21,620,917	$22,269,544

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 1: PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

12-Jan-02

Debt Service:

Begining Principal	$25,401	
Term	20	Years
Rate	8.25%	

Year	Principal	Interest	Total	Outs. Balance
				$25,401
1	$540	$2,096	$2,636	$24,862
2	$584	$2,051	$2,636	$24,277
3	$633	$2,003	$2,636	$23,644
4	$685	$1,951	$2,636	$22,960
5	$741	$1,894	$2,636	$22,218
6	$803	$1,833	$2,636	$21,416
7	$869	$1,767	$2,636	$20,547
8	$940	$1,695	$2,636	$19,607
9	$1,018	$1,618	$2,636	$18,589
10	$1,102	$1,534	$2,636	$17,487
11	$1,193	$1,443	$2,636	$16,294
12	$1,291	$1,344	$2,636	$15,003
13	$1,398	$1,238	$2,636	$13,605
14	$1,513	$1,122	$2,636	$12,092
15	$1,638	$998	$2,636	$10,454
16	$1,773	$862	$2,636	$8,681
17	$1,919	$716	$2,636	$6,761
18	$2,078	$558	$2,636	$4,684
19	$2,249	$386	$2,636	$2,435
20	$2,435	$201	$2,636	$0
21	$0	$0	$0	$0
22	$0	$0	$0	$0
23	$0	$0	$0	$0
24	$0	$0	$0	$0
25	$0	$0	$0	$0
Total	$25,401	$27,309	$52,710	

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 1: PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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Depreciation & Operating Costs:

Year		1	2	3	4	5	6	7	8	9	10
O&M		$2,400	$2,472	$2,546	$2,623	$2,701	$2,782	$2,866	$2,952	$3,040	$3,131
Admin		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other		($79)	($79)	($79)	($79)	($79)	($79)	($79)	($79)	($79)	($79)
Residue Trans & Disp.		$2,025	$2,086	$2,148	$2,213	$2,279	$2,348	$2,418	$2,490	$2,565	$2,642
Total		$4,346	$4,479	$4,615	$4,756	$4,901	$5,051	$5,205	$5,363	$5,526	$5,695
Depreciation:											
10 Year	$12,500	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
28 Year	$13,550	$484	$484	$484	$484	$484	$484	$484	$484	$484	$484
20 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$26,050	$1,734	$1,734	$1,734	$1,734	$1,734	$1,734	$1,734	$1,734	$1,734	$1,734

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 1: PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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12-Jan-02

Depreciation & Operating Costs:

Year	11	12	13	14	15	16	17	18	19	20
O&M	$3,225	$3,322	$3,422	$3,524	$3,630	$3,739	$3,851	$3,967	$4,086	$4,208
Admin	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other	($79)	($79)	($79)	($79)	($79)	($79)	($79)	($79)	($79)	($79)
Residue Trans & Disp.	$2,721	$2,803	$2,887	$2,974	$3,063	$3,155	$3,250	$3,347	$3,447	$3,551
Total	$5,868	$6,046	$6,230	$6,419	$6,614	$6,815	$7,022	$7,235	$7,454	$7,680
Depreciation:										
10 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
28 Year	$484	$484	$484	$484	$484	$484	$484	$484	$484	$484
20 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$484	$484	$484	$484	$484	$484	$484	$484	$484	$0 $484

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 1: PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

Depreciation & Operating Costs:

Year	21	22	23	24	25	26	27	28	29	30
O&M	$4,335	$4,465	$4,599	$4,737	$4,879	$5,025	$5,176	$5,331	$5,491	$5,656
Admin	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Residue Trans & Disp.	$3,657	$3,767	$3,880	$3,997	$4,116	$4,240	$4,367	$4,498	$4,633	$4,772
Total	$7,992	$8,232	$8,479	$8,733	$8,995	$9,265	$9,543	$9,829	$10,124	$10,428
Depreciation:										
10 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
28 Year	$484	$484	$484	$484	$484	$484	$484	$484	$0	$0
20 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$484	$484	$484	$484	$484	$484	$484	$484	$0	$0

NYC DRUM BASED COMPOSTING **PAGE 9**
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 1: PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc. **12-Jan-02**

Financial Results:

Year		Yr 1 (6 Mnths)	2	3	4	5	6	7	8	9	10
Revenues		$4,725,000	$9,733,500	$10,025,505	$10,326,270	$10,636,058	$10,955,140	$11,283,794	$11,622,308	$11,970,977	$12,330,107
Operating Exp		$2,172,967	$4,478,685	$4,615,417	$4,756,252	$4,901,311	$5,050,723	$5,204,616	$5,363,127	$5,526,392	$5,694,556
IBIT		$2,552,033	$5,254,815	$5,410,088	$5,570,018	$5,734,747	$5,904,417	$6,079,178	$6,259,181	$6,444,585	$6,635,550
Interest Exp		$2,095,615	$2,051,074	$2,002,858	$1,950,665	$1,894,166	$1,833,005	$1,766,799	$1,695,130	$1,617,549	$1,533,568
Depreciation		$866,967	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935
Taxable Income		($410,550)	$1,469,806	$1,673,294	$1,885,418	$2,106,646	$2,337,477	$2,578,444	$2,830,116	$3,093,100	$3,368,047
Tax @ 47%		($192,958)	$690,809	$786,448	$886,147	$990,124	$1,098,614	$1,211,869	$1,330,155	$1,453,757	$1,582,982
A. T. Income		($217,591)	$778,997	$886,846	$999,272	$1,116,523	$1,238,863	$1,366,575	$1,499,961	$1,639,343	$1,785,065
Depreciation		$866,967	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935	$1,733,935
Debt Principal		$539,891	$584,432	$632,647	$684,841	$741,340	$802,501	$868,707	$940,375	$1,017,956	$1,101,938
Net Cash Flow:											
($355,000)	($6,350,348)	$109,485	$1,928,501	$1,988,134	$2,048,366	$2,109,118	$2,170,297	$2,231,804	$2,293,521	$2,355,322	$2,417,063

Total Equity $6,705,348

10 Year IRR 18.05% Excludes Residual Value
22 Year IRR 24.56% Excludes Residual Value

22 Yr NPV @:
7.50% $11,372,048 Excludes Residual Value
10.00% $7,871,005 Excludes Residual Value

Debt Coverage Ratio	0.97	1.99	2.05	2.11	2.18	2.24	2.31	2.37	2.45	2.52

Avg DCR:
year 1-10 2.12
Year 1-20 2.54

ASED COMPOSTING
INANCIAL ANALYSIS
PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
Y: R. S. Lynch & Company, Inc.

ults:

Year	11	12	13	14	15	16	17	18	19	20
Revenues	$12,700,010	$13,081,010	$13,473,440	$13,877,644	$14,293,973	$14,722,792	$15,164,476	$15,619,410	$16,087,992	$16,570,632
Operating Exp	$5,867,765	$6,046,170	$6,229,927	$6,419,197	$6,614,144	$6,814,941	$7,021,761	$7,234,786	$7,454,201	$7,680,199
IBIT	$6,832,245	$7,034,840	$7,243,514	$7,458,447	$7,679,829	$7,907,851	$8,142,715	$8,384,625	$8,633,791	$8,890,433
Interest Exp	$1,442,658	$1,344,248	$1,237,720	$1,122,402	$997,571	$862,442	$716,164	$557,818	$386,409	$200,858
Depreciation	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935
Taxable Income	$4,905,652	$5,206,657	$5,521,859	$5,852,110	$6,198,322	$6,561,475	$6,942,616	$7,342,871	$7,763,447	$8,205,640
Tax @ 47%	$2,305,656	$2,447,129	$2,595,274	$2,750,492	$2,913,212	$3,083,893	$3,263,030	$3,451,150	$3,648,820	$3,856,651
A. T. Income	$2,599,995	$2,759,528	$2,926,585	$3,101,618	$3,285,111	$3,477,582	$3,679,587	$3,891,722	$4,114,627	$4,348,989
Depreciation	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935
Debt Principal	$1,192,847	$1,291,257	$1,397,786	$1,513,103	$1,637,934	$1,773,064	$1,919,342	$2,077,688	$2,249,097	$2,434,647
Net Csh Flw	$1,891,083	$1,952,206	$2,012,734	$2,072,450	$2,131,111	$2,188,453	$2,244,180	$2,297,969	$2,349,465	$2,398,277
Debt Coverage Ratio	2.59	2.67	2.75	2.83	2.91	3.00	3.09	3.18	3.28	3.37

ASED COMPOSTING
INANCIAL ANALYSIS
PRIVATE OWNERSHIP / UNFAVORABLE ASSUMPTIONS
Y: R. S. Lynch & Company, Inc.

ults:

Year	21	22	23	24	25	26	27	28	29	30
Revenues	$17,067,751	$17,579,784	$18,107,177	$18,650,393	$19,209,904	$19,786,201	$20,379,787	$20,991,181	$21,620,917	$22,269,544
Operating Exp	$7,992,042	$8,231,803	$8,478,758	$8,733,120	$8,995,114	$9,264,967	$9,542,916	$9,829,204	$10,124,080	$10,427,802
IBIT	$9,075,709	$9,347,980	$9,628,420	$9,917,272	$10,214,790	$10,521,234	$10,836,871	$11,161,977	$11,496,837	$11,841,742
Interest Exp	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Depreciation	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$0	$0
Taxable Income	$8,591,774	$8,864,045	$9,144,485	$9,433,337	$9,730,855	$10,037,299	$10,352,936	$10,678,042	$11,496,837	$11,841,742
Tax @ 47%	$4,038,134	$4,166,101	$4,297,908	$4,433,668	$4,573,502	$4,717,531	$4,865,880	$5,018,680	$5,403,513	$5,565,619
A. T. Income	$4,553,640	$4,697,944	$4,846,577	$4,999,669	$5,157,353	$5,319,769	$5,487,056	$5,659,362	$6,093,323	$6,276,123
Depreciation	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$483,935	$0	$0
Debt Principal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Net Csh Flw	$5,037,575	$5,181,879	$5,330,512	$5,483,604	$5,641,288	$5,803,704	$5,970,991	$6,143,297	$6,093,323	$6,276,123

Debt Coverage Ratio ********** ********** ********** ********** **********

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

09-Jan-02

ASSUMPTIONS:

Capital Costs:		**Development Equity: First 6 Mos. of Proj Devel.**	**Second 6 Mos. of Proj Devel.**	**Upon Proj. Fin. $000**	**deprec. per. (Years)**
Initial Marketing, RFP Response		$0			
Final Marketing, Prel Eng., Pricing & Contracting			$30,000		
Final Eng. & Des., Permitting & Dev. of Proj. Financing			$300,000		
Project Financing & Construction: ($000)					
Equip (Including 2 digest.)				$12,500	
100,000 SF Bldg @	$70 per SF			$7,000	
Biofilters				$3,000	
5 Acre Site Improvements				$150	
Perf. Guarantee @10%				$1,250	
Int Dur. Const (18 Months)				$2,139	
Barrower's Counsel				$50	
Conting.& spare pts @ 10%				$1,250	
Debt Res. Fund				$0	
Financing:					
	Underwritting Fee @ 1% assumes G.O. Debt			$288	
	Underwritters's Counsel			$50	
	Issuer's fee @ 1%, if required			$288	
	Bond Counsel			$50	
	Feas. Opin.			$125	
	Trustee			$50	
	Cusip, printing & Other			$50	
	Financial Advis.			$25	
Other		$0	$0	$250	28
SUB TOTAL		$0	$330,000	$28,516	
TOTAL				$28,846	
Financing Assumptions:					
	Debt (%/Amt)	100%	100%	100%	$28,846
	Equity (%/Amt)	0%	0%	0%	$0
	Total Capital				$28,846
	Avg. % Equity			0.00%	
	Debt Term			20	years
	Debt Rate			5.00%	

Operating Costs (000):			**Ann. Esc. Rate**	**per ICI Ton**
O&M + R&R Cost		$2,400	3.00%	$26.67
2,000,000 kwh/yr @	$0.120	$240	3.00%	
Other (DSRF Int. @ 3.0%)		$-0	0.00%	$-0.00
Res. Disp. @ $65/T, 15%ICI		$878	3.00%	$9.75
TOTAL		$3,518		$39.08

Throughput:	**TPD**	**DPY**	**TPY**
ICI	300.00	300	90000

Fees per ton:

ICI Tip Fee (w/ Res Disp) -	$55.00	3.00%
Sold Compost Rev (FOB Plnt)	$15.00	1.50%

Financial Results:

10 Year IRR	NA
20 Year IRR	NA

Debt Cov. Ratio:	
Year 1	0.51
Avg. Yr. 1-10	1.09
Avg. Yr. 1-20	1.28

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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Year	1	2	3	4	5	6	7	8	9	10
Revenues:										
ICI Tons	90000	90000	90000	90000	90000	90000	90000	90000	90000	90000
ICI Tip Fee	$55.00	$56.65	$58.35	$60.10	$61.90	$63.76	$65.67	$67.64	$69.67	$71.76
ICI Revenue	$4,950,000	$5,098,500	$5,251,455	$5,408,999	$5,571,269	$5,738,407	$5,910,559	$6,087,876	$6,270,512	$6,458,627
Compost Tons (50%ICI)	45000	45000	45000	45000	45000	45000	45000	45000	45000	45000
Rev/T	$15.00	$15.23	$15.45	$15.69	$15.92	$16.16	$16.40	$16.65	$16.90	$17.15
Compost Revenue	$675,000	$685,125	$695,402	$705,833	$716,420	$727,167	$738,074	$749,145	$760,382	$771,788
Total Revenue	$5,625,000	$5,783,625	$5,946,857	$6,114,832	$6,287,689	$6,465,573	$6,648,633	$6,837,021	$7,030,894	$7,230,415

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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Year	11	12	13	14	15	16	17	18	19	20
Revenues:										
MSW Tons	90000	90000	90000	90000	90000	90000	90000	90000	90000	90000
MSW Tip Fee	$73.92	$76.13	$78.42	$80.77	$83.19	$85.69	$88.26	$90.91	$93.63	$96.44
MSW Revenue	$6,652,386	$6,851,958	$7,057,516	$7,269,242	$7,487,319	$7,711,939	$7,943,297	$8,181,596	$8,427,044	$8,679,855
Compost Tons	45000	45000	45000	45000	45000	45000	45000	45000	45000	45000
Rev/T	$17.41	$17.67	$17.93	$18.20	$18.48	$18.75	$19.03	$19.32	$19.61	$19.90
Compost Revenue	$783,365	$795,116	$807,042	$819,148	$831,435	$843,907	$856,565	$869,414	$882,455	$895,692
Total Revenue	$7,435,751	$7,647,073	$7,864,559	$8,088,390	$8,318,754	$8,555,845	$8,799,862	$9,051,010	$9,309,499	$9,575,547

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

Year	21	22	23	24	25	26	27	28	29	30
Revenues:										
MSW Tons	90000	90000	90000	90000	90000	90000	90000	90000	90000	90000
MSW Tip Fee	$99.34	$102.32	$105.39	$108.55	$111.80	$115.16	$118.61	$122.17	$125.84	$129.61
MSW Revenue	$8,940,251	$9,208,458	$9,484,712	$9,769,253	$10,062,331	$10,364,201	$10,675,127	$10,995,381	$11,325,242	$11,664,999
Compost Tons	45000	45000	45000	45000	45000	45000	45000	45000	45000	45000
Rev/T	$20.20	$20.51	$20.81	$21.13	$21.44	$21.76	$22.09	$22.42	$22.76	$23.10
Compost Revenue	$909,127	$922,764	$936,605	$950,655	$964,914	$979,388	$994,079	$1,008,990	$1,024,125	$1,039,487
Total Revenue	$9,849,378	$10,131,222	$10,421,317	$10,719,908	$11,027,245	$11,343,589	$11,669,206	$12,004,371	$12,349,367	$12,704,486

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

09-Jan-02

Debt Service:

Begining Principal	$28,846	
Term	20	Years
Rate	5.00%	

Year	Principal	Interest	Total	Outs. Balance
				$28,846
1	$872	$1,442	$2,315	$27,973
2	$916	$1,399	$2,315	$27,057
3	$962	$1,353	$2,315	$26,095
4	$1,010	$1,305	$2,315	$25,086
5	$1,060	$1,254	$2,315	$24,025
6	$1,113	$1,201	$2,315	$22,912
7	$1,169	$1,146	$2,315	$21,743
8	$1,228	$1,087	$2,315	$20,515
9	$1,289	$1,026	$2,315	$19,226
10	$1,353	$961	$2,315	$17,873
11	$1,421	$894	$2,315	$16,452
12	$1,492	$823	$2,315	$14,960
13	$1,567	$748	$2,315	$13,393
14	$1,645	$670	$2,315	$11,748
15	$1,727	$587	$2,315	$10,021
16	$1,814	$501	$2,315	$8,208
17	$1,904	$410	$2,315	$6,303
18	$1,999	$315	$2,315	$4,304
19	$2,099	$215	$2,315	$2,204
20	$2,204	$110	$2,315	$0
21	$0	$0	$0	$0
22	$0	$0	$0	$0
23	$0	$0	$0	$0
24	$0	$0	$0	$0
25	$0	$0	$0	$0
Total	$28,846	$17,447	$46,293	

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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Depreciation & Operating Costs:

Year		1	2	3	4	5	6	7	8	9	10
O&M		$2,400	$2,472	$2,546	$2,623	$2,701	$2,782	$2,866	$2,952	$3,040	$3,131
Admin		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other		$-0	$-0	$-0	$-0	$-0	$-0	$-0	$-0	$-0	$-0
Residue Trans & Disp.		$878	$904	$931	$959	$988	$1,017	$1,048	$1,079	$1,112	$1,145
Total		$3,278	$3,376	$3,477	$3,581	$3,689	$3,800	$3,914	$4,031	$4,152	$4,276
Depreciation:											
10 Year	$12,500	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
28 Year	$14,689	$525	$525	$525	$525	$525	$525	$525	$525	$525	$525
20 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$27,189	$1,775	$1,775	$1,775	$1,775	$1,775	$1,775	$1,775	$1,775	$1,775	$1,775

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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Depreciation & Operating Costs:

Year	11	12	13	14	15	16	17	18	19	20
O&M	$3,225	$3,322	$3,422	$3,524	$3,630	$3,739	$3,851	$3,967	$4,086	$4,208
Admin	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other	$-0	$-0	$-0	$-0	$-0	$-0	$-0	$-0	$-0	$-0
Residue Trans & Disp.	$1,179	$1,215	$1,251	$1,289	$1,327	$1,367	$1,408	$1,450	$1,494	$1,539
Total	$4,405	$4,537	$4,673	$4,813	$4,958	$5,106	$5,259	$5,417	$5,580	$5,747
Depreciation:										
10 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
28 Year	$525	$525	$525	$525	$525	$525	$525	$525	$525	$525
20 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$525	$525	$525	$525	$525	$525	$525	$525	$525	$525

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
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Depreciation & Operating Costs:

Year	21	22	23	24	25	26	27	28	29	30
O&M	$4,335	$4,465	$4,599	$4,737	$4,879	$5,025	$5,176	$5,331	$5,491	$5,656
Admin	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Residue Trans & Disp.	$1,585	$1,632	$1,681	$1,732	$1,784	$1,837	$1,892	$1,949	$2,008	$2,068
Total	$5,920	$6,097	$6,280	$6,468	$6,662	$6,862	$7,068	$7,280	$7,499	$7,724
Depreciation:										
10 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
28 Year	$525	$525	$525	$525	$525	$525	$525	$525	$0	$0
20 Year	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$525	$525	$525	$525	$525	$525	$525	$525	$0	$0

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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09-Jan-02

Financial Results:

Year	Yr 1 (6 Mnths)	2	3	4	5	6	7	8	9	10
Revenues	$2,812,500	$5,783,625	$5,946,857	$6,114,832	$6,287,689	$6,465,573	$6,648,633	$6,837,021	$7,030,894	$7,230,415
Operating Exp	$1,638,750	$3,375,825	$3,477,100	$3,581,413	$3,688,855	$3,799,521	$3,913,506	$4,030,912	$4,151,839	$4,276,394
IBIT	$1,173,750	$2,407,800	$2,469,757	$2,533,419	$2,598,834	$2,666,053	$2,735,127	$2,806,109	$2,879,055	$2,954,021
Debt Service	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644
Debt Coverage Ratio	0.51	1.04	1.07	1.09	1.12	1.15	1.18	1.21	1.24	1.28
Avg DCR:										
year 1-10	1.09									
Year 1-20	1.28									

NYC DRUM BASED COMPOSTING
LIFE CYCLE FINANCIAL ANALYSIS
SCENARIO 2: PUBLIC OWNERSHIP / FAVORABLE ASSUMPTIONS
PREPARED BY: R. S. Lynch & Company, Inc.

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Financial Results:

Year	11	12	13	14	15	16	17	18	19	20
Revenues	$7,435,751	$7,647,073	$7,864,559	$8,088,390	$8,318,754	$8,555,845	$8,799,862	$9,051,010	$9,309,499	$9,575,547
Operating Exp	$4,404,686	$4,536,827	$4,672,931	$4,813,119	$4,957,513	$5,106,238	$5,259,425	$5,417,208	$5,579,724	$5,747,116
IBIT	$3,031,065	$3,110,247	$3,191,627	$3,275,271	$3,361,241	$3,449,607	$3,540,437	$3,633,801	$3,729,774	$3,828,431
Debt Service	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644	$2,314,644
Debt Coverage Ratio	1.31	1.34	1.38	1.42	1.45	1.49	1.53	1.57	1.61	1.65

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Financial Results:

Year	21	22	23	24	25	26	27	28	29	30
Revenues	$9,849,378	$10,131,222	$10,421,317	$10,719,908	$11,027,245	$11,343,589	$11,669,206	$12,004,371	$12,349,367	$12,704,486
Operating Exp	$5,919,530	$6,097,115	$6,280,029	$6,468,430	$6,662,483	$6,862,357	$7,068,228	$7,280,275	$7,498,683	$7,723,643
IBIT	$3,929,848	$4,034,107	$4,141,288	$4,251,478	$4,364,763	$4,481,232	$4,600,978	$4,724,096	$4,850,684	$4,980,843
Debt Service	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Debt Coverage Ratio	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR