The Technological Economics Of Glass Recycling

V.II

by

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Appendix A

Returnable/Refillable Containers

Appendix A

A.1 Calculation Of Trippage

OECD (1978) defines trippage as:

The number of times a refillable bottle is used for delivering beverage to the consumer.

To calculate trippage, the OECD report used the following equation:

$$\text{Total Trippage, } Tt = \frac{Ub}{N * \text{Avg Size}}$$

where:

Ub = Sales volume in returnable bottles

N = Number of incremental new returnable bottles brought to repace losses in period

To convert this quantity into the same unit as numerator (sales volume in litres, gallons, etc.),

it needs to be multiplied by:

Avg Size = The average size (in litres, gallons, etc.) of returnable bottles

Sweden calculates consumer trippage (Tc) by deducting the figure for in-plant breakages from N to yield the number of bottles that consumers have failed to return (Ncon).

Thus Consumer Tippage (Tc) is given by:

$$Tc = \frac{Ub}{Ncon * \text{Avg Size}}$$

These formulas will yield accurate figures for trippage unless the number (N) of new returnable bottles bought in the period does not equal the number of returnables lost in that period. This may occur when there is a sharp increase in the total beverage sales or a shift in the container mix in favour of returnables which require an increase in the float of returnable bottles.

As well as total trippage, off premise trippage is important. Within closed systems such as in public houses, trippages can be higher than the average. Off-premises trippage refers to sales from retailers to consumers for 'home' consumption.

Off-premise trippage (Tt 'off) can be devised the formula:

$$\text{Tt 'off'} = \frac{1}{1 - (ARR_{OFF} - APB_{OFF})}$$

where:

ARR_{OFF} - return rate for 'off' premise sales

APB_{OFF} - inplant breakage rate

The inplant breakage rate for 'off' premise returnables (APB_{OFF}) can be expected to be similar or not significantly greater than breakage rate for 'on' premise sales, so it is reasonable to use total in plant breakage rate (APB) (2% for the OECD Survey)

More difficult is the calculation of return rate for 'off' premise sales (ARR_{OFF}), as they will differ from 'on' premise return rate. There is a lack of information available as to the actual size of 'off' premise return rate (ARR_{OFF}). The OECD (1978) used the following formula:

$$ARR = \frac{a.ARR_{OFF} + b.ARR_{ON}}{a + b}$$

where:

ARR = Average Return Rate For All Beverage Sales

ARR_{OFF} = Average Return Rate For 'OFF' premise sales

ARR_{ON} = Average Return Rate For 'ON' premise sales

a = Proportion of returnable beverage sales made to 'OFF' premise customers

b = Proportion of returnable beverage sales made to 'ON' premise customers

The calculation of 'OFF' premise return rate (ARR_{OFF}) requires estimation of total return (ARR), the 'ON' premise return rate, and the proportion of returnable sales made to 'ON' and 'OFF' premise customers.

A.2 Legislation On Returnables

A.2.1 Denmark

The first legislative measure aimed at the reduction of waste was Act No 293 of 8 June 1971 on containers for beer and beverages. Under this Act the Minister for the Environment prohibited the sale of carbonated soft drinks in non-returnable containers. The use of non-returnable containers for beer is regulated by voluntary agreement and should be completely phased out by the end of 1981.

Most of the sales of beers occur in returnable bottles that carry a deposit. The 33 cl green-brown bottle accounts for about 90% of all movements of beer. Other bottle types have an average trippage rate of 25. The Minister is also aiming to limit the number of different types of bottles on the market. This Act has been challenged within the EEC as it was seen as a means of restricting the 'free' movement of goods within the Community, and thus to be in contravention of the Treaty of Rome.

Act No 297 of 8 June 1978 on the Re-Use of Paper and Drink Packaging and the Reduction of Waste, covers materials like paper, cartons and cardboard materials. This Act is a framework under which the Minister can establish rules regarding:

1. The content in materials or products of raw materials, additives or processing aids preventing the re-use of these materials.
2. The content of previously used and re-usable materials.
3. The restriction, prohibition or mandatory use of certain packaging materials, for milk products and drinks.

4. Deposit arrangements.

5. The collection of reclaimable materials and products.

Under this Act the Minister may also make grants for the development of processes and technical methods that can encourage the re-use of materials.

A.2.2 West Germany

In its Waste Management Programme (1975) the Federal Government indicates that, apart from intensified efforts towards the controlled disposal of waste, increased recycling of wastes should be encouraged, for reasons of resource conservation and the reduction of disposal costs. The disposal of wastes is regulated for the whole of the country by the Law of Disposal of Wastes. The Government is empowered to make orders to impose restrictions on those wrappings or containers, which in view of type, composition, volume or quantity would be costly to dispose of as compared with equally suitable wrappings or containers. For example the sale of PET bottles was prohibited unless the dumping or burning of used bottles was prevented.

Special emphasis has been placed on the beverage industry, to control waste production. The Federal Government will not allow any further increase of the number of beverage containers in household waste that require disposal. First, the existing returnable system for beverage containers has to be retained and promoted. Second, the recycling of material coming from beverage containers and other packaging has to be increased.

The Federal Government (14 October 1981) identified two fundamental issues on waste management:

1. Increasing toxicity of wastes.

2. Reutilisation and recycling of wastes.

The Federal Government determined to strengthen activities of recycling and reutilisation of wastes, by giving them a legal basis, in an amendment to the Waste Disposal Act. The success of such a policy depends on the attitude of the relevant sectors of industry and of the public. In areas where contractutral policy has been followed and it does not resolve the issue of packaging materials, the Federal Government envisages fiscal solutions.

The German Cabinet has suggested that retailers should offer a balanced assortment of beverages in returnable containers as well as in non-returnable containers. This they felt would be in the interest of the environment and would be supported by legal regulations. Such legislation can be introduced in the fourth revision of the Waste Disposal Law (ABG).

The Interior Minister has criticised the refusal of the Aldi retail chain to stock returnables alongside non-returnables and regretted that there was no voluntary agreement to restrict the expansion of disposable containers. To counter this the Government has no choice but to take action centrally.

Zimmerman criticised manufacturers of aluminium drinks for labelling them as re-usable, which misled the public.

The West German glass container industry say that there recycling programme negates any need for legislation. There aim is to recover 100% of the disposable bottles produced for the mass drinks market. In 1984 they recovered 800,000 tonnes of used glass, nearly 80% of production (Section 12).

In light of the proposed legislation, the glass industry feels that their actions achieve the Governments objectives. They have clearly marked returnable or reusable bottles to make the consumer aware of the difference. In addition disposable bottles could also be marked - with an internationally accepted recycling symbol. This they feel would counter the need for legislative measures, particularly in targets of reclaiming 100% of production.

These moves on beverage containers indicates the Federal Government's determination to require those sectors of industry and commerce that market problematical articles, to contribute to the solution of the problems of waste generation in accordance with the 'Polluter Pays' principle. The Government believes that private activities should have priority, in the context of an overall approach which integrates both re-use and disposal of waste materials.

A.3 Legislation - The American Experience

A.3.1 Introduction

Since Oregon introduced deposit legislation in October 1972, 8 States have followed suit. They are: Vermont (July 1973), Maine (November 1976), Michigan (December 1978), Iowa (July 1979), Connecticut (January 1980), and New York (September 1983). This legislation has been introduced on environmental grounds, in particular to reduce the impact of litter.

The remaining states do not have deposit legislation. In 1980, 31 states rejected such legislation. This has been done at the level of State Government, some times in consultation with the public. From 19 referenda that were conducted, consumers rejected legislation on 16 occassions. Surveys have showed that voters rejected legislation because they felt:

Little effect would be made on litter.
Consumer prices would increase.
Returnables are inconvenient.

These factors are first reviewed in terms of the Oregon experience.

A.3.2 The Oregon Experience

The Oregon Bottle Bill was introduced in 1972 to reduce the beverage container component of litter. This legislation required that all beverage containers carry a refundable value of at least \$0.05. This is reduced to \$0.02 for standard containers. In addition the sale of all beverage cans with detachable parts, e.g. ring pulls are prohibited. An assessment of the legislation has shown a decrease in household solid waste, a decrease in raw materials requirements and a decline in energy use.

A.3.2.a Litter

The Oregon legislation lead to the reduction in roadside litter:

1. The number of beverage containers littered per mile of road per month fell from 127 to 43.
2. Beverage related litter fell from 30% to 11% of total pieces.
3. Measured by volume, beverage container litter declined from 43% to 19% of total litter.

This reduction was achieved despite a general upward trend in littering, thus the above figures may underestimate the impacts of legislation. The present bulk of roadside litter (90%) is unaffected by the legislation as it is non-beverage related.

However, in conjunction with the introduction of this legislation, there was an increase in expenditure by the State on litter collection and anti-litter publicity.

Generally, the other States showed a reduction in the quantity of litter. In Vermont litter was reduced by 14.6% after two years. In Maine litter fell by 10% in the first two years, but rose by 5% in the next year. In Michigan an urban/industrial State litter increased by 10% in the first year after the Bill.

The effect on litter is unclear, as beverage containers make up a relatively small proportion - 16% on highways and 5% on urban roads. An examination is necessary on the quantity and proportion of materials in litter.

RASMUSSEN (1984) conducted a survey on the perceptions of litter and the willingness to pay for control in Western New York. It is higher prices and not loss of convenience that is the main cost of returnable container legislation to New Yorkers. Thus, it was necessary to estimate how much consumers value a less littered environment and whether they would be willing to pay higher prices for beer and soft drinks to reduce litter. As the major benefit of a returnable container law is the probable 90% reduction in bottle and can litter, the survey sought to determine whether public are sensitive to bottle and can litter and would value a less littered environment.

Table A3.1 summarises the results of the question on whether litter was a problem. In the main respondents felt that litter was a problem. This concern is consistent with positive views on environmental issues.

TABLE A3.1 Do You Think Littering Is A Big Problem, Something Of A Problem, Or Not Much Of A Problem?

RESPONSE:	Number N	Percentage %
A Big Problem:	106	63
Someting Of A Problem:	52	31
Not Much Of A Problem:	10	6

SOURCE: RASMUSSEN A The Bottle Bill: Perceptions Of Inconvenience, Litter, And Willingness To Pay In Western New York' Environment International 10 pp35-38 1984

These benefits need to be examined in terms of their costs. This encounters the problem of putting a monetary value on the amenity value of litter free roadsides and parks. To try and assess this people are asked how much they would be 'willing to pay' for a particular benefit.

In the assessment of the Bottle Bill the State estimated that consumer prices were likely to rise by 10¢ per case of beer or soft drinks. RASMUSSEN asked respondents whether they would be willing to pay an extra 10¢ per case of drink to reduce litter, in addition to a 5¢ deposit. For those, who were willing to pay 10¢, he asked whether they would pay 15¢.

The results show that 75% of respondents were willing to pay 10c and 42% were willing to pay 15c. These figures confirm the views of the legislator that people are willing to pay higher prices for reduced beverage container litter. But this willingness to pay, falls as price increases moves from 10c to 15c.

An alternative approach to litter abatement was followed by Washington State. This was done through advertising, public education and voluntary recycling. After 4 years, litter fell by 66% and between 1975-77 was reduced by 14.8%. A comparative study showed that Washington had 29% less litter than Oregon. They found litter collection costs in Oregon were 31c per head, compared to Washington's 22c per head. Washington raises revenue for its anti-litter program from all industries and commercial undertakings associated with products that might end up as litter, which includes retailers and restaurants as well as packaging manufacturers ($150 per $1 million of gross sales).

However, such benefits are restricted. The Bottle Bill has broader environmental benefits of waste management savings and raw material savings. These need to be considered as part of a total systems approach.

A.3.2.b Household Solid Waste Management

In Oregon household solid waste is estimated to have decreased 4-5% by weight. This indicates a decrease of 80-90% in beverage containers entering the solid waste stream. In the short run this is likely to lead to a decline in solid waste management costs of 1%, in disposal costs. In the long run savings may rise to 5% with disposal and collection savings.

The Resource Conservation Comittee set up by President Carter concluded in 1978 that a federal deposit law for beverage containers would reduce solid waste by 2% by weight nationally. As with litter, solid waste consists of much more than just beverage containers. In fact US EPA suggests beverage containers make up 5-6% of solid waste, including refillables.

Views expressed in Glass View show that even with a 2% reduction in solid waste there would be minimal disposal cost savings and no collection cost savings. Based on National figures disposal cost savings would be $22 million (1979 prices).

The Glass Industry feel that a more effective way to reduce solid waste is to recycle glass, aluminium, etc. In Washington State there were 725 voluntary recycling centres in 1979 collecting $31.2 million worth of materials. They make no mention of the collection and processing costs. The volume of solid waste recovered is likely to reduce disposal costs by $4.5 million, or 25% of predicted savings due to deposit laws. On this basis, disposal savings would be greater than $22 million on a National basis.

A.3.2.c Energy

In Oregon, energy savings are roughly 56% of initial requirements. In the USA the energy debate focuses on two areas:

1. Does Bottle Bill make consumers opt for more refillable containers and bring about a reduction in use of energy and raw materials.
2. Should oil - main fuel used in US refillable system - be conserved, at expense of raw materials, gas and coal used to manufacture new Bottles.

Whether more energy is required to refill bottles rather than manufacture a new one is linked to trippage and the distance from retailer to bottler. In addition to the total amount of energy used, it is important to consider the different types of energy consumed.

With a refillable system, more fuel will be used in distributing containers as they are heavier and bulkier. In addition, empty bottles have to be collected and returned for cleaning and refilling. This is likely to lead to an increase in petrol and diesel consumption. Comparing Washington and Oregon States, the Coca Cola company stated that they required 47.4 gallons and 94 gallons respectively to distribute 1000 cases. This difference may reflect differences in distance, distribution system, as well as the use of refillable containers.

In Michigan petrol and diesel consumption rose 25% per case for beer distribution, and 32% for soft drinks distribution since the introduction of the Bottle Bill in 1978. This was equivalent to an extra 4,380,000 extra gallons of fuel during 1979.

With a non-returnable system less oil is used, but more gas, coal and raw materials are used in the manufacture of new bottles. With the Government concerned with costs of oil imports, a switch from other fuels to oil could affect the country's economy. A study by Battelle Columbus Laboratories (1978) estimated that 2 million extra barrels of oil would be used nationally per year if the refillable system was adopted. This is an increase of 33% over the present distributing systems.

Also, if a refillable system was adopted new heavier bottles would have to be made, plant modified, transport and cleansing systems. It was suggested in 1976 that the cost to convert to an all returnable beverage container would be around $5 billion. Figures from the Batelle study calculate energy requirements of such a change at 8.5 million barrels of oil.

Benefits from improved energy consumption, a reduction in litter costs and waste management costs are dependant on the trippage attained by the returnable system. Table A3.2 shows the changes that occurred in market share and trippage following on the introduction of the Bottle Bill in Oregon. Improved trippage will lead to savings in materials - aluminium and steel. Also in Oregon there was a reduction in the demand for glass.

The success of the legislation in Oregon is due to the high return rates, which reflects the ease with which consumers are able to return containers. The system of lower deposits for 'certified standard bottles' indicates that it is the ease of return that is of greater importance than the size of deposit for increasing return rates.

TABLE A3.2 Changes In Container Market Shares In Oregon

Percentage Of Containers Which Were:	12 Months Prior To Implementation Of Bill	12 Months After Implementation Of Bill
RETURNABLE BOTTLES		
Beer	31	96
Soft Drinks	53	88
CANS		
Beer	40	3
Soft Drinks	40	12

TABLE A3.3 Changes In Return Rates In Oregon Following The Bill

Returnable Bottle/Beverage	12 Months Prior To Implementation Of Bill	12 Months After Implementation Of Bill
NON-STANDARD		
Beer	75%	90%
Soft Drinks	80%	92%
STANDARD		
Beer	75%	95%

A.3.2.d. Prices

There is some confusion over the effect of a move to an all returnable system would have on price levels. In the long term retailers, wholesale distributors and bottlers may need extra staff, facilities and equipment to store and handle the empties. This is likely to lead to an increase in costs which will be passed on to the consumer. To some extent these costs are offset by cash collected due to unclaimed deposits, cash from selling non-refillable containers to manufacturers for recycling or from cash saved by refilling rather than purchasing new bottles.

In Oregon there was a change in retail prices, with consumers paying slightly less in total than for the same volume of beverages than before pre-Bill conditions. This increase in prices may reflect the imposition of deposits on each container. A report by the Can Manufacturers Institute showed that in 1979 consumers in Oregon were paying 22% more for beverages than those in neighbouring states.

In general other States showed an increase in price after the introduction of the Bottle Bill. These price rises, are primarily viewed in comparison with neighbouring states:

<table>
<tr><th>STATE</th><th>Soft Drinks</th><th>Beer</th></tr>
<tr><td>Michigan</td><td>+36c</td><td>+30c</td></tr>
<tr><td>Connecticut</td><td>+17%</td><td>+14%</td></tr>
<tr><td>Iowa</td><td colspan="2">+80c</td></tr>
<tr><td>Maine</td><td></td><td>+22%</td></tr>
<tr><td>Vermont</td><td colspan="2">+10-15%</td></tr>
<tr><td>Oregon</td><td colspan="2">+22%</td></tr>
</table>

A comparison is necessary against pre-Bottle Bill prices, to see if there have been any increase in real terms.

A general study in 1980 by the Food Marketing Institute showed retailers spend an average of 2.3c per container they take back into their store. This extra cost would be passed on to the consumer in higher prices.

As RASMUSSEN showed in his study, people were willing to pay extra costs for refillable beverages, to gain the perceived environmental benefits.

In Oregon capital losses were negligible, as it was possible to transfer equipment to neighbouring markets. But the shift to a refillable system resulted in an increase in capital investment of $3.2 million in plant and equipment and $1.6 million in bottle stock. These costs occur primarily in the first year.

GUDGER and WATTEN (1976) show that the Oregon Bill resulted in $16.5 million in the beverage industry's operating income. This results from savings in container costs for soft drink bottlers and brewers due to use of refillable bottles. These savings are offset against container manufacturers' lost profit and increased costs of returnable system for beverage manufacturers, distributors and retailers. Gudger & Watten estimate these costs at $12.5 million, a net operating surplus of $3.9 million. In contrast a survey by ADS showed a decline in income of $6.9-8.6 million. This difference is due to the fact that the ADS study uses a lower trippage, which means that the container cost saving figure is lower. This again highlights the importance of trippage to the success of the policy measure.

A.3.2.e Sales

As deposit laws can affect consumer prices this may lead to a fall in sales. In addition many consumers do not claim back their deposits, which further inflates the price of the drink. INCPEN estimates that consumers lose £20 million a year, in the USA estimates are $500 million if a refillable system was adopted nationwide.

Glass View (1980) reported a decline in the sale of beer after the introduction of the Bottle Bill. Examples are:

In Michigan	beer sales fell 6.5% in 1979; 3.4% in 1980
	soft drink sales fell 22% in 1979
Vermont	beer sales fell 9.1% in 1974
Maine's	beer sales fell 6.8% in 1978
Connecticut	beer sales fell 9.1% in 1980
Iowa	beer sales fell 2.9% between Aug '79 - July '80

In Oregon the consumption of beverages did not decline as a result of legislation, although beer sales did slip in 1973 in line with National experience. The decline in sales in other States may also reflect changes in national consumption patterns.

As Bottle Bill can affect consumer choice:

- as stores taking empties back were cramped for space, they were forced to reduce the variety of beverages they stocked;

- outlets reduced brands, and size range;

this may affect sales within the State. Purchases of particular sizes and brands may be made in neighbouring states where there is no deposit law and consumers may be brewing their own beer.

The reduction in beverage sales has a knock on effect in terms of revenue from federal taxes:

Michigan faced a tax loss of	$6 million	in 1979
Oregon	$667,000	in 1973
Vermont	$547,000	in 1975
Maine	$1,169,000	in 1978
Iowa	$1,900,000	in Aug'79-Jan'80
Connecticut	$2,100,000	in 1980

The loss in beer excise revenue for the 6 States in their first year was $12.4 million (made up of $4.4 million at State level and $8 million at Federal Level). If a National deposit law reduced beer sales by 5% in the first year the Federal Government could lose $80 million in beer excise tax revenue. In addition, individual States could lose a further $40 million.

A.3.2.f Employment

The introduction of deposit legislation in the long term will reduce the number of new containers that are manufactured, causing a reduction in the number of jobs in packaging manufacturers and fillers. However, this will be offset by an increase in jobs amongst distributors and retailers who have to employ more people to handle returned empties.

In Oregon the employment effects have·proved positive with a net increase of 365 full time jobs and a net labour earnings increase of $1.6 million. Within the job market there is a transfer from skilled to unskilled jobs.

The US Department of Commerce calculated back in 1975 that a National Deposit Law - 100% conversion to refillables - would cost 82,000 skilled and semi-skilled jobs in manufacturing industry.

A.3.3 Summary

Because of the 'uncertain impacts on prices and labour' Carter's Resource Conservation Comittee decided in July 1979 not to recommend a National Deposit Law. This decision was based on 2 years study of Michigan, Oregon, Vermont and Maine. Since, this study 3 States have introduced deposit legislation based on local conditions.

As the aim of deposit laws has been to reduce litter, other methods of control should be examined. Education programmes, and voluntary recycling schemes have been successful in Washington State. Both options need to be examined together, as the proportion of litter that is made up from beverage containers is fairly small.

Energy can be saved if certain trippages are attained. This needs to be assessed in terms of fuel type used to serve the various beverage systems.

One effect of Bottle Bills has been a rise in consumer prices. An assessment needs to be made of people's willingness to pay extra costs to achieve perceived environmental benefits. A rise in prices, may lead to a fall in sales and a fall in Government revenues.

In terms of employment, there tends to be a net increase but this is in terms of unskilled jobs with the loss of unskilled manufacturing jobs.

Although the retail distribution network and consumer trends are different in UK, many similarities can be drawn.

Appendix B

Glass Recovery Options

Appendix B

B.1 Bottle Recovery Schemes

Similar to FOE (W Cumbria) Bottle Recovery Scheme a number of private companies have operated a recovery service for re-usable containers (Milk, Beer and Carbonated Soft Drinks) for a long period of time. One of the larger companies is Milk Vessels Recovery Ltd (MVR) who run 13 depots in England and Wales covering the high population areas. The headquarters is at Tottenham, London; which deals with Greater London and the Home Counties as well as acting as a clearing station for other depots.

In 1983 they will recover 60 million milk bottles, collected from: large and small dairies throughout England and Wales, and also from boat stations, offices, police stations, colleges and other venues. This is a decline from the 113 million bottles dealt with in the early 1979's (GMF Report) of which 400,000 were rejected as cullet by merchants, without payment. In the holiday season milk bottles from the Midlands and the North find their way to, and are collected from South Coast resorts at the rate of 12000 per fortnight. The recovered bottles are put through a washing machine and are discharged on to a moving belt from which they are sorted, inspected and put into the crates of the dairies that own them. These are returned to the dairies by MVR's own transport. At present (1983) MVR employs 185 people (Carter 1983).

A second company is Receptacle Recoveries Ltd based in the Greater Manchester Area. The firm collects only 'pint milk' bottles, at approximately 250,000 per month about 3 million per year. This is down from the 10 million recovered in 1970's (GMF Report) and is a reflection of the changes in the market with new packaging (plastic/cardboard).

The firm is not involved in transporting or collecting but is dependant upon dairies culling 'foreign' bottles from their bottling lines and bringing them in (ANON 1983b). The bottles are sorted by hand on conveyor belts but are not washed. The scheme employs 12 people. The delivered bottles once sorted are uplifted by the respective dairies. Cullet from this operation is collected by Norfolk Salvage Sheffield, at about 4 tonnes per month. The company acts as a sorting station with transport handled by the participating dairies.

A third company Birmingham Bottle Exchange owned by the members of the Birmingham Soft Drinks Association Ltd, and gives a service of returning their bottles to them and also non-members. It recovers all types of returnable bottles, syphons and crates. The firm originally operated in the Midlands, but as it is now one of only two Bottle Exchanges in the country it has loads from National companies from afar. It recovers 'foreign' bottles from members collections. These are sorted - washed if necessary - repacked and returned. They now employ 5 people. Cullet is collected by a local merchant for delivery to Glass Manufacturers. All types of bottles - milk, beer and carbonated soft drinks come into the Exchange and any returnable and reusable bottles are returned to the owner for reuse, as with cases and pallets. There are now a lot of non-returnable bottles which have to be culleted and PET bottles which have to be destroyed. In 1970 GMF Report states that about 12 million milk and 6 million otner bottles were treated. In 1981 this was down to 2.5 million; in 1982 it was 2.26 million and in 1983 2.11 million (WALLINGTON 1985).

8.A DONCASTER REFUSE PROCESSING PLANT: OUTLINE FLOW SHEET

11205

Markets

Market research regarding recovered material has shown the following results:

Material	Intended Use
Glass Cullet	The Glass Container Industry.
Ferrous Metals	The Ferrous Casting Industry.
Combustibles (paper/plastics)	Waste derived fuel for general industrial use.

Process residuals with potential value.

Fines	Cover material in landfill operations.
Putrescibles	Soil conditioner in derelict land reclamation.

Further developments to the plant are being carried out which will increase the markets available.

Paper-rich fraction (large papers)	Secondary fibre, possibly suitable for paper-board industry.
Non-ferrous metals	Recovery of copper and aluminium.

Additional research on the plant and process will proceed with the following possible developments envisaged.

Methane	Fuel for in-house requirements and industry.
Putrescibles (digested)	Agricultural and Horticultural compost.
Glass	New products (e.g. tiles).
Tin Cans	De-tinning to produce secondary metal.

PROJECT PROGRESS

Start of WSL Refuse Sorting Project	1972
Start of Doncaster Project	1976
Pilot scale tests at WSL	1976-78
Commencement of Building Contract	September 1977
Commencement of Plant Installation	September 1978
Commissioning of Primary Core	September 1979
Completion of Plant Commissioning	Spring 1980.

MAIN FEATURES

Nominal Design Capacity	$10th^{-1}$ per stream
Initial plant layout	Single stream
Ultimate capacity	Twin stream
Effective refuse storage	300t
Rating of compactors for transfer	$32th^{-1}$

Appendix B

B.3 Flakt RRR System

B.3.1 Introduction

Flakt aimed to recover the paper and cardboard constituent from the waste stream as a secondary fibre. To this end, Flakt adopted a dry sorting system to simplify up-grading of recovered materials (MOWLE 1981). Further additions to this process allows a range of products to be recovered:

1. Paper fibre grades
2. Refuse Derived Fuel (RDF)
3. Organic Rich Fraction For Composting
4. Ferrous Metals
5. Non-Ferrous Metals
6. Glass
7. Plastics Rich

B.3.2 The Flakt Process

The basic operation comprises three main stages (HOLMES 1981):

1. Front End
   - This covers the preparation (mechanical sizing) and sorting (classification) of the waste stream up to RDF stage.

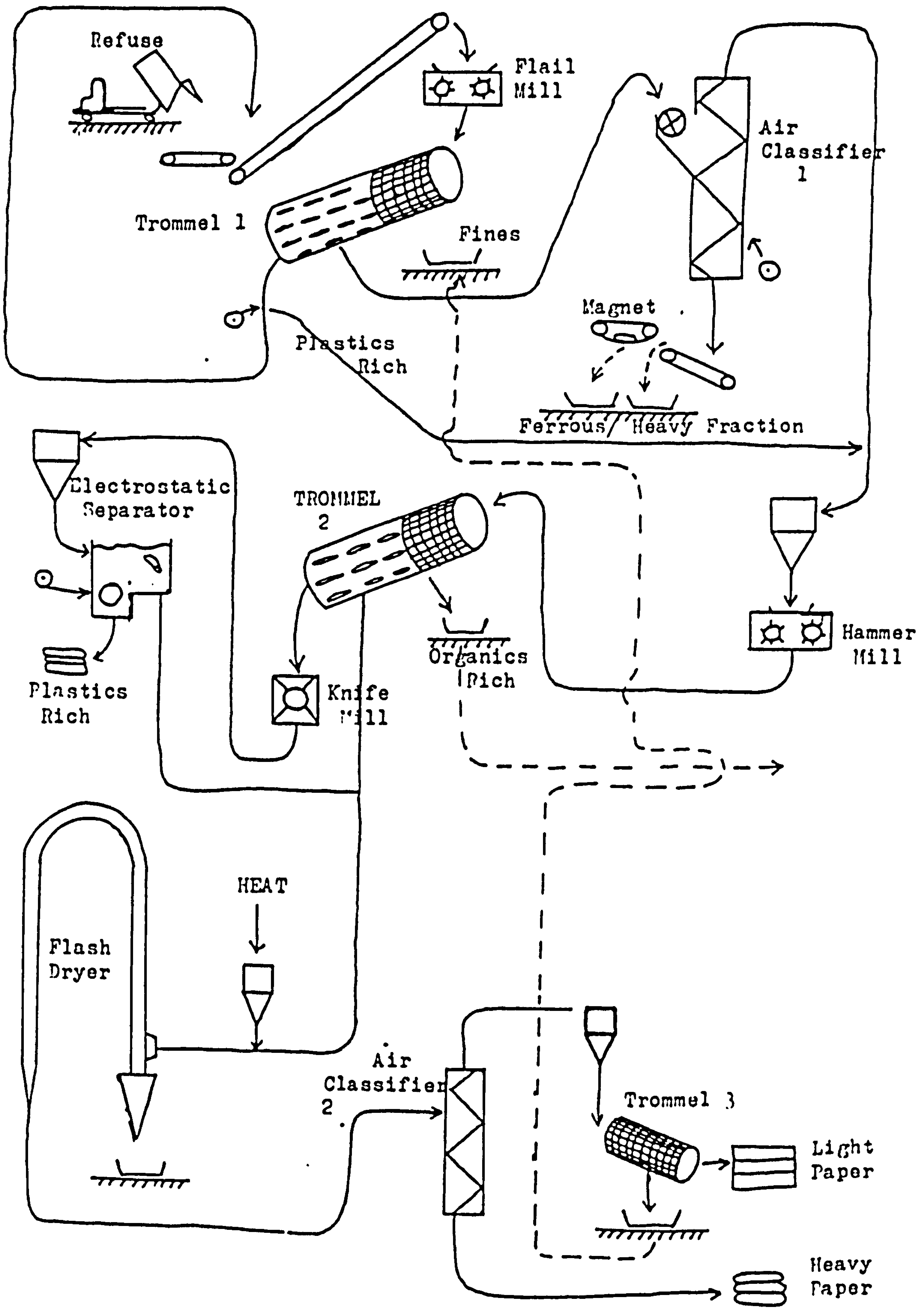
2. Back End
   This covers drying and heat treatment of paper rich material, to render it biologically stable. This makes it more amenable to storage and suitable for board manufacturing processes.

3. Up-Grading
   This includes separation into light paper fraction, being primarily mechanical fibres (newsprint) and heavy paper, being primarily chemical fibres.

B.3.3 Technical Problems

Figure 5.B.a shows the flow sheet of the Flakt process for the Wijster Plant in Holland.

Figure 58a Flow Sheet Of Flakt (Resource recovery from refuse) Plant For VAM Recycling At Wijster, Netherlands.



First, the contents of the waste sacks needs to be released, but not necessarily shredded as this consumes energy and generates dust. The Flakt process uses a flail mill to produce pieces of fairly uniform size. Next, the trommel screen separates out large items such as plastic film and textiles. The effect of the trommel is to even out volumetric flow.

A zig zag vertical air classifier is used next. This enhances the classification process by contributing a battering effect that further exposes the material. A rising air stream of controlled velocity carries lighter fractions upwards, whilst the heavier fraction falls through the air stream. It uses a partially closed air circulation with 10% filtered and discharged creating a drying effect.

The heavier material is conveyed through the magnetic separator to remove ferrous metal. Then a secondary shredder reduces particle size and frees impurities. The material then passes to a secondary trommel where fine impurities are removed. The organic rich material goes to form a compost. The secondary trommel rejects plastic film, paper and textiles. Most of these impurities is removed at the front end, but some light weight plastics remain. To remove these, heat treatment is used, which causes contraction of thermoset plastics, which can then be separated aerodynamically.

Upgrading divides materials into fractions and reduces impurities. Products are: paper fibre, ferrous metals, organic fines and plastic rich components. The rejects include glass and aluminium which can be separated.

Table B.3.1 compares the operation of two operating Flakt plants.

At the time of design the recovery of non-ferrous metals and glass was not considered to be financially attractive (MOWLE 1981).

TABLE B.3.1 Comparison Of Two Flakt RRR Plants

OPERATOR	VAM Recycling Bv	SKAFAB
LOCATION	Wijster, Holland.	Stockholm, Sweden.
AVERAGE REFUSE ANALYSIS BY WEIGHT (%)		
Paper & Cardboard	23	50
Ferrous Metals	3	5
Plastics	6	8
Vegetable Matter	37	20
Miscellaneous	31	17
Moisture Content By Weight (%)	37	22
Average Density Of Refuse (kg/m)	250	125
PLANT DETAILS		
Capacity: tonnes per year	100,000	50,000
Operation: hours per year	4,800	4,000
Installed: power kW	1,400	1,000
heat kW	3,000	2,000
ANTICIPATED RECOVERY TONNES PER YEAR		
PAPER	18,500	17,500
FERROUS METALS	2,800	2,500
PLASTICS RICH	3,600	3,300
ORGANICS RICH	26,000	12,000

SOURCE: HOLMES J R R Refuse, Recycling & Recovery
John Wiley 1981

B.3 Sorain-Cecchini System

B.3.1 Introduction

Methods used for recovery and recycling of domestic refuse in Rome were developed with special reference to local factors (BIRCH & JACKSON 1979). Refuse is collected on a daily basis, using plastic sacks and vehicles with no compaction. This minimises any degeneration of organic wastes and allows its possible use for animal feed.

The products from the process are:

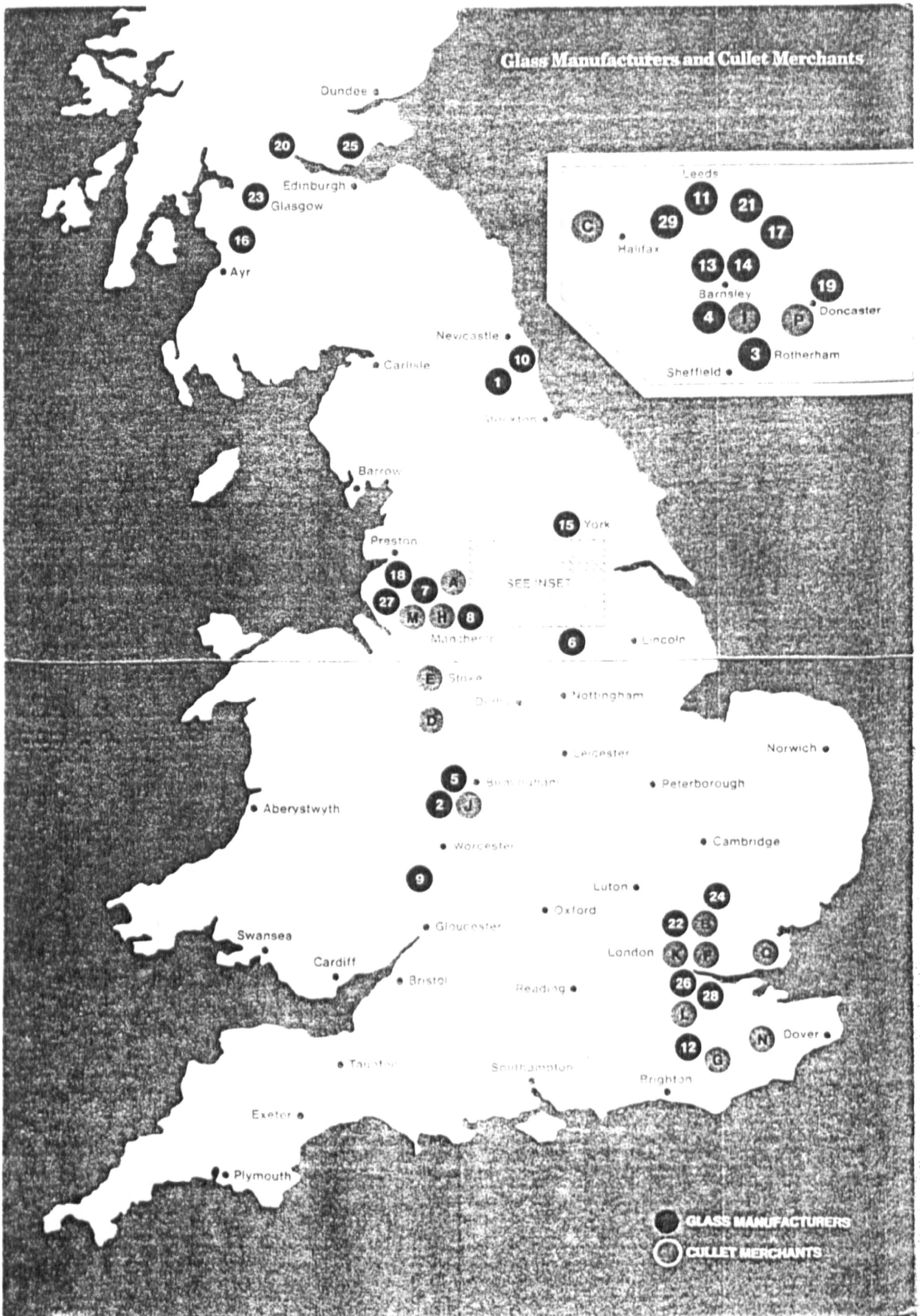
compost
animal feed
ferrous metal
paper pulp
plastics.

Recovery plants are designed so that a central plant mechanically separates various constituents and passes them onto a series of secondary plants where sorting is continued, which recycle separate materials to form marketable products. The quantity recovered varies from 50 to 90% of materials available in refuse. The remainder of the refuse is incinerated, with the steam generated being used for re-processing.

Appendix C

Bottle Bank System

Figure C.1 Map Of Glass Manufacturers And Cullet Merchants



Source: GMF (Undated) Glass Recycling Directory

Glass Manufacturers

1 Abrahams & Co. Ltd.,
Brama Teams Glassworks,
Gateshead, NE8 2RA,
Co. Durham.
Tel. 0632 605321
Mr. A. D. Thompson

2 Albion Bottle Co. Ltd.,
Rood End Road,
Oldbury,
Warley,
Worcs. B69 4HP.
Tel. 021-552 5221
Mr. D. J. Rewhorn

3 Beatson, Clark & Co. Ltd.,
23 Moorgate Road,
Rotherham,
Yorks. S60 2AA
Tel. 0709 79141
Mr. T. Burkinshaw

4 Beatson, Clark & Co. Ltd.,
Stairfoot,
Nr. Barnsley,
S. Yorks.
(contact as above)

5 Chance Bros. Ltd.,
P.O. Box 39,
Smethwick,
Warley,
Worcs. B66 1NY
Tel. 021-553 1824
Mr. R. D. Blackburn

6 Co-operative Wholesale Soc. Ltd.,
Glass Factory,
Sandy Lane,
Worksop,
Notts. S80 3ET
Tel. 0909 2241
Mr. J. Corney

7 C.W.S. Ltd.,
Webster Street,
Platt Bridge,
Nr. Wigan,
Lancs.
Tel. 0942 66251
Mr. B. Grady

8 English Abrasives Ltd.,
Brittania Mills,
Hulme Hall Road,
Manchester, M15 4LU
Tel. 061-834 3602
Mr. S. V. Slight

9 Glass Fibres & Equipment Ltd.,
Murray-Scott Works,
10 Belle Vue Terrace,
Malvern,
Worcs.
Tel. 06845 62422
Mr. G. J. Nicholls

10 Hartley Wood & Co. Ltd.,
Portobello Glassworks,
Portobello Lane,
Monkwearmouth,
Sunderland SR6 0DN
Tel. 0783 72506

11 Lax & Shaw Ltd.,
South Accommodation Road,
Leeds, LS10 1NQ
Tel. 0532 21568
Mr. R. Robinson

12 Lewis & Towers Ltd.,
Fircroft Way,
Edenbridge,
Kent.
Tel. 073-271 3122
Mr. W. N. Towers

13 Potters-Ballotini Ltd.,
Pontefract Road,
Barnsley,
Yorks.
Tel. 0226 87591
Mr. A. Cramphorn

14 Redfearn National Glass Ltd.,
Monk Bretton,
P.O. Box No. 7,
Barnsley,
Yorks.
(Contact as No. 15)

15 Redfearn National Glass Ltd.,
Fishergate,
York, YO1 4AD
Tel. 0904 28521
Mr. T. N. Bucknall

16 Rockware Glass Ltd.,
Irvine,
Ayrshire
(Contact Head Office 19a)

17 Rockware Glass Ltd.,
Headland Glassworks,
Knottingley,
Yorks. WF11 0HP.
(Contact Head Office 19a)

18 Rockware Glass Ltd.,
Atlas Glassworks,
P.O. Box No. 41,
St. Helens,
Lancs.
(Contact Head Office 19a)

19 Rockware Glass Ltd.,
Wheatley,
Doncaster,
Yorks.
(Contact as No. 19a)

19a Rockware Glass Ltd.,
Head Office,
Rockware Avenue,
Greenford,
Middx. UB6 0AQ
Tel. 01-578 4353
Mr. M. Revans

20 U.G. Glass Containers Ltd.,
Alloa Glassworks,
Alloa,
Clackmannanshire
(Contact Head Office 27a)

21 U.G. Glass Containers Ltd.,
Lumb's Glassworks,
Castleford,
Yorks.
(Contact Head Office 27a)

22 U.G. Glass Containers Ltd.,
Davey & Moore Ltd.,
Lockfield Avenue,
Brimsdown,
Enfield,
Middx.
(Contact Head Office 27a)

23 U.G. Glass Containers Ltd.,
Shettleston Glassworks,
Old Shettleston Road,
Glasgow, E.2.
(Contact Head Office 27a)

24 U.G. Glass Containers Ltd.,
Key Glassworks,
Edinburgh Way,
Harlow,
Essex.
(Contact Head Office 27a)

25 U.G. Glass Containers Ltd.,
Kinghorn Glassworks,
Kinghorn,
Fifeshire.
(Contact Head Office 27a)

26 U.G. Glass Containers Ltd.,
Key Glassworks,
Cold Blow Lane,
New Cross
London S.E.14.
(Contact Head Office 27a)

27 U.G. Glass Containers Ltd.,
Peasley Glassworks,
P.O. Box No. 40,
Peasley Cross Lane,
St. Helens,
Lancs.
(Contact Head Office 27a)

27a U.G. Glass Containers Ltd.,
Head Office,
Kingston Road,
Staines,
Middx.
Tel. Staines 51321
Mr. J. N. C. Bowyer

28 Universal Milling Co. Ltd.,
Latona Road,
London, SE15 6RX
Tel. 01-639 0408
Mr. W. Miles

29 Versil Ltd.,
Rayner Mills,
Liversedge,
Yorks.
Tel. 0976 22571
Mr. E. M. Davison

Cullet Merchants

DETAILS OF CULLET HANDLED — Yes / Preferably

Map Reference		Take Flint Glass	Take Coloured Glass	Take Sheet Glass	Second-Hand Bottles	Colours Separated	No Foreign Matter	Further Processing	Will Collect Glass	Will Deliver	Min. Quant. (Tonnes)
A	Askatask										
B	Berryman										2
C	Calder Metal										1
D	Daton										
E	Dorking Minerals										2
F	East Anglian Metal										10
G	Gronsund										
H	David Hughes										9
I	Jordan										10
J	Jukes										
K	Nelson										3
L	Posnett										4
M	Richardson										
N	Roe										
O	Seymour Haulage										4
P	Yorkshire Bottle										10

Cullet Merchants

A Askatask Ltd.,
Champness Hall,
Drake Street,
Rochdale, Lancs.
Tel. 0706 50170

B T. Berryman & Son Ltd.,
347 Church Road,
Leyton,
London, E.10.
Tel. 01-539 4901

C Calder Metal Co. Ltd.,
Calder Mill,
Stubbing Holme,
Hebden Bridge,
Yorkshire.
Tel. Hebden Bridge 2361

D Daton Reclamation Ltd.,
Daton House,
7 & 8, Friars Road,
Stafford.
Tel. 59106

E Dorking Minerals Co. Ltd.,
Halmerend Works,
Stoke on Trent,
Tel. 0782-720 536

F East Anglian Metal Merchants,
Fresh Wharf,
Highbridge Road,
Barking,
Essex, 1G11 7BH
Tel. 01-591 7141

G Johs. Gronsund & Co. (Shipping) Ltd.,
50 Henwood Road,
Pembury,
Tunbridge Wells,
Kent.

H David Hughes & Co. Ltd.,
Rutland Street,
Swinton,
Manchester.
Tel. 061-794 0815

I H. Jordan,
48 Park Avenue,
Royston,
Nr. Barnsley,
Yorks.

J L. J. Jukes (Glass Mchts),
11 Mornington Road,
Smethwick,
Warley,
Worcs.
Tel. 021-558 0689

K A. Nelson & Sons,
24 St. Pauls Way,
London, E.3.
Tel. 01-529 3599

L R. Posnett & Sons Ltd.,
Rear of 54, Park Road,
South Norwood,
London, S.E.25.
Tel. 01-653 5200

M Richardson Metals,
2 Burtonhead Road,
St. Helens,
Lancs.
Tel. 0744 23894

N C. A. Roe,
Fourways,
Maidstone Road,
Headcorn,
Kent.
Tel. 062-783 462
and
138 Homerton High Street,
London E9 6JA.
Tel. 01-985 7720

O Seymour Haulage Ltd.,
32 Northern Avenue,
South Benfleet,
Essex.
Tel. South Benfleet 57459

P Yorkshire Bottle Co. Ltd.,
Tickhill Road,
Bawtry,
Doncaster,
Yorks.
Tel. 0302 710531

Reference : 58/613

INCOMPLETE STATISTICS

THE BOTTLE BANK SCHEME: A SUMMARY OF THE PROGRESS DURING THE LAST QUARTER (APRIL - JUNE) 1984

It is important to note that the following statistics only concern the Bottle Bank scheme and do not include details of the amount of cullet collected by cullet merchants, voluntary groups etc. that are not associated with the scheme.

GENERAL FIGURES

a) THE BOTTLE BANK SCHEME WAS RECYCLING AT THE FOLLOWING RATE - (IN TONNES OF GLASS EVERY YEAR; THIS INCLUDES CULLET COLLECTED FROM OTHER SOURCES): 83,804 tonnes

b) TOTAL NUMBER OF DISTRICT COUNCILS WITH A BOTTLE BANK SITE: 306

c) TOTAL NUMBER OF BOTTLE BANK SITES COLLECTING GLASS: 2,000

LARGE BOTTLE BANK SITES : 785
MODULAR BOTTLE BANK SITES : 1215

d) TOTAL NUMBER OF TOWNS & CITIES WITH A BOTTLE BANK SITE: 783+

+ Estimated figures.

APRIL TO JUNE FIGURES

a) TOTAL COLLECTED THROUGH BOTTLE BANK SITES ONLY: 20,164 tonnes
i) Large Bottle Banks : 10,795 tonnes
ii) Modular Bottle Banks : 8,707 tonnes
iii) Undistinguishable : 662 tonnes

b) TOTAL COLLECTED VIA OTHER SOURCES: 787 tonnes
i) Industrial Sources : 258 tonnes
ii) Commercial Sources : 529 tonnes

c) AVERAGE COLLECTION PER SITE PER WEEK: 0.78 tonnes

d) TOTAL NUMBER OF WEEKLY USERS: 4.2 million people

e) TOTAL NUMBER OF DISTRICT COUNCILS WHO HAD A NEW SCHEME LAUNCHED IN THEIR AREA DURING APRIL - JUNE: 7

f) RESPONSE RATE : (CALCULATED FROM POTENTIAL NUMBER OF USERS: 37,830,835) 11%

g) AVERAGE WEIGHT OF GLASS COLLECTED PER HEAD OF POPULATION THAT HAVE A SCHEME IN THEIR AREA: 0.53 kg

PGM/TI
Disk PGM015

QUARTER: 2nd Quarter 1984 ISSUED:

COUNTY/DISTRICT COUNCIL	NO OF SITES (L= LARGE) (M=MODULAR)	POP PER SITE ('000s)	TONNES COLLECTED BOTTLE BANKS	TONNES COLLECTED OTHER SOURCES	KG PER HEAD POP.	SCHEME LAUNCHED	TOTAL TONNAGE TO DATE
AVON:							
KINGSWOOD	4 (L)	20.85	134.59*	44.87*	2.15*	7.10.80	1 299.99*
BEDFORDSHIRE:							
N BEDFORD	7 (L)	18.54	166.73		1.29	8. 9.80	2 042.61
S BEDFORD	8 (M)	13.44	108.91		1.01	29. 3.83	486.14
LUTON	6 (M)	26.90	46.63		0.29	27.10.83	101.81
BERKSHIRE:							
BRACKNELL	6 (L) 2 (M)	10.22	242.22	41.17	2.96	28. 4.80	3 683.74
NEWBURY	3 (M)	42.00	90.32		0.72	11. 3.80	1 541.27
READING	6 (L) 2 (M)	17.52	273.40	13.86	2.02	4.12.81	6 999.92
WINDSOR & M'HD	3 (L) 1 (M)	32.95	124.98	0.69	0.95	4.11.80	2 467.00
WOKINGHAM	3 (L) 2 (M)	22.32	130.02		1.17	27. 3.80	2 502.57
BORDERS:							
ETTRICK & L	4 (L)	8.23	27.93		0.85	21. 3.80	469.12
ROXBURGH	1 (L) 3 (M)	8.80	42.16*	28.12*	1.60*	12. 6.80	155.83*
TWEEDDALE	1 (L) 3 (M)	3.44	18.50*	0.98*	1.34*	12. 6.81	321.98*
BUCKINGHAMSHIRE:							
AYLESBURY VALE	7 (M)	18.27	75.81	1.84	0.61	14. 7.82	509.35
SOUTH BUCKS	4 (M)	14.03	90.48	3.99	1.68	20.10.82	490.90
CHILTERN	8 (M)	10.84	135.68		1.56	14.11.80	1 227.24
WYCOMBE	9 (M)	16.77	129.30		0.86	16.12.82	714.55
CAMBRIDGESHIRE:							
CAMBRIDGE	15 (M)	6.71	193.55		1.92	28. 4.82	1 528.52
E CAMBRIDGE	2 (M)	26.85				26. 9.83	
FENLAND	5 (M)	13.24				21.12.82	
PETERBOROUGH	2 (L)	66.00	23.00		0.17	3. 1.83	188.32
CENTRAL:							
CLACKMANNAN	1 (L) 7 (M)	6.00	16.21		0.34	22. 9.78	343.03
FALKIRK	6 (L) 8 (M)	10.27	41.87	133.05	1.00	1.11.78	2 416.00
STIRLING	5 (L) 3 (M)	9.91	55.62		0.70	22. 9.78	875.50

KEY

The majority of Councils weigh their Bottle Bank containers as they are emptied but, the remainder are indicated as follows, because the Councils:

* Obtain their figures from the recycling plant + Estimate their figures

Reference: 58/613 BOTTLE BANK PROGRESS REPORT

COUNTY/DISTRICT COUNCIL	NO OF SITES (L= LARGE) (M=MODULAR)	POP PER SITE ('000s)	TONNES COLLECTED BOTTLE BANKS	OTHER SOURCES	KG PER HEAD POP.	SCHEME LAUNCHED	TOTAL TONNAGE TO DATE
CHESHIRE:							
CHESTER	5 (L)	23.08	83.39		0.72	9.10.80	1 150.82
ELLESMERE P&N	4 (L)	21.38	49.43		0.58	8.10.80	503.24
VALE ROYAL:	2 (L)	55.30	43.75		0.40	12.12.80	470.25
(NORTHWICH)	(2 (L))		(43.75)			(12.12.80)	(470.25)
WARRINGTON	11 (M)	16.99	75.54*		0.40*	6.12.82	461.33*
CLEVELAND:							
HARTLEPOOL	1 (L)	94.30	4.55		0.05	21. 5.82	58.96
MIDDLESBOROUGH	12 (M)	12.66	17.92		0.12	21. 9.83	50.67
CLWYD:							
COLWYN BAY	7 (L)	6.96	75.60		1.55	15.11.77	2 070.72
CORNWALL:							
RESTORMEL	5 (L)	15.32	55.68*		0.73*	9.11.78	797.68*
CUMBRIA:							
(EDEN)	1 (L)	27.24	12.00+		0.44+	29. 4.81	232.00+
(S LAKELAND)	4 (L)	23.55	45.00+		0.48+	29. 4.81	451.00+
BARROW IN FURNESS	2 (L)	35.40	12.00+		0.17+	5.10.83	39.00+
CARLISLE	7 (L)	14.06	45.00		0.46	28. 4.83	189.00
DERBYSHIRE:							
CHESTERFIELD	4 (L)	24.08	37.80*		0.39*	3. 7.80	722.18*
W DERBYSHIRE	2 (M)	33.25				16. 1.84	
DEVON:							
(E DEVON)	2 (L)	53.00	40.00		0.38	9.12.80	
(N DEVON)	3 (L)	26.40	21.00		0.27	2. 4.80	
(EXETER)	4 (L)	24.05	72.00		0.75	9.12.80	
(S HAMS)	1 (L)	66.80	12.00		0.18	15.12.83	2 105.69
(TEIGNBRIDGE)	5 (L)	19.08	49.00		0.51	15.12.83	
(TIVERTON)	1 (L)	58.20	22.00		0.38	1. 4.80	
(TORBAY)	3 (L)	36.10	47.00		0.43	15.12.83	
(TORRIDGE)	1 (L)	47.80	12.00		0.25	3. 4.80	

KEY

The majority of Councils weigh their Bottle Bank containers as they are emptied but, the remainder are indicated as follows, because the Councils:

* Obtain their figures from the recycling plant   + Estimate their figures

COUNTY/DISTRICT COUNCIL	NO OF SITES (L= LARGE) (M=MODULAR)	POP PER SITE ('000s)	TONNES COLLECTED BOTTLE BANKS	OTHER SOURCES	KG PER HEAD POP.	SCHEME LAUNCHED	TOTAL TONNAGE TO DATE
DORSET:							
W DORSET	4 (L)	20.20	37.90*		0.47*	18.11.80	994.64*
PURBECK	1 (L)	39.00	12.60		0.32	9. 1.84	21.90
WEYMOUTH/P'LD	3 (L)	19.27	44.90		0.78	16. 1.81	700.79
DUMFRIES & G'WAY:							
NITHSDALE	2 (L)	27.50	13.17*		0.24*	8. 4.81	487.67*
STEWARTRY	2 (M)	11.10	NOT AVAILABLE			9. 9.83	59.00+
DURHAM:							
CHESTER-LE-ST	2 (L)	25.50	10.69		0.21	12.10.82	73.16
DARLINGTON	4 (L) 4 (M)	11.89	69.51		0.73	8. 7.80	922.83
DURHAM	4 (L)	21.83	30.60*		0.35*	1. 4.82	333.91*
DYFED:							
CARMARTHEN	2 (L)	24.95	NOT AVAILABLE			1.12.82	23.28*
ESSEX:							
BASILDON	12 (M)	12.60	99.10		0.66	3. 2.83	510.78
BRAINTREE	10 (M)	11.28	73.02		0.65	24. 9.82	576.88
BRENTWOOD	1 (L) 4 (M)	14.22	37.89		0.53	12. 4.84	200.37
(ESSEX CC)	(1 (L))		(19.44)			N/A	(181.92)
ESSEX:							
(CHELMSFORD)	4 (L)	34.20	98.28		0.72	18. 4.78	2 717.96
CASTLE POINT	9 (M)	9.42	69.69		0.82	28. 4.83	335.19
COLCHESTER	3 (L) 13 (M)	8.73	173.50		1.24	15. 9.82	3 080.91
(ESSEX CC)	(3 (L))		(65.90)			(20.12.78)	(2 380.41)
EPPING FOREST	4 (M)	28.03	85.60		0.76	3. 7.82	618.97
HARLOW	7 (M)	11.31	64.95		0.82	18.10.82	407.23
MALDON	7 (M)	6.58	47.65		1.03	8. 2.83	251.08
ROCHFORD	8 (M)	9.01	48.75		0.68	21.10.82	305.30
SOUTHEND-ON-SEA	11 (M)	14.05	95.90		0.62	26.10.82	639.37
TENDRING	3 (L) 4 (M)	15.83	64.88		0.59	7. 3.83	259.67
(ESSEX CC)	(3 (L))		(24.28)			(23. 6.83)	(51.39)
UTTLESFORD	4 (L)	14.57	63.01		1.08	19. 7.82	363.21

KEY

The majority of Councils weigh their Bottle Bank containers as they are emptied but, the remainder are indicated as follows, because the Councils:

* Obtain their figures from the recycling plant + Estimate their figures

Reference: 58/613 BOTTLE BANK PROGRESS REPORT

COUNTY/DISTRICT COUNCIL	NO OF SITES (L= LARGE) (M=MODULAR)	POP PER SITE ('000s)	TONNES COLLECTED BOTTLE BANKS	OTHER SOURCES	KG PER HEAD POP.	SCHEME LAUNCHED	TOTAL TONNAGE TO DATE
FIFE:							
DUNFERMLINE	3 (L) 14 (M)	7.40	75.02		0.60	12. 6.80	687.62
N E FIFE	4 (L) 20 (M)	2.71	86.69*		1.33*	2. 6.80	837.68*
KIRCALDY	4 (L) 7 (M)	13.59	66.77*		0.45*	2.11.78	1 333.74*
MID GLAMORGAN:							
OGWR	4 (L)	30.08	NOT AVAILABLE			9.12.82	100.74*
GLOUCESTERSHIRE:							
CHELTENHAM	5 (L)	17.14	NOT AVAILABLE			28.11.78	2 346.15
COTSWOLD	1 (L)	69.20	43.84		0.63	30. 1.80	731.80
FOREST OF DEAN	6 (L)	12.13	67.60		0.93	7.11.80	578.47
GLOUCESTER	6 (L)	15.28	96.14		1.05	20.12.79	1 809.00
STROUD	8 (L)	12.58	126.42		1.26	16. 4.80	2 048.82
TEWKESBURY	3 (L)	26.91	49.94		0.62	29. 6.80	631.24
GRAMPIAN:							
ABERDEEN	11 (L)	18.99	69.07	111.82	0.73	18. 3.82	1 264.94
BANFF & BUCHAN	4 (L)	19.93	26.40		0.33	1. 4.82	211.60
GORDON	5 (L)	12.01	30.13	5.57	0.50	1. 7.82	229.34
KINCARDINE & D	5 (L)	8.00	18.55*	3.27*	0.55*	1. 5.81	351.37*
GWENT:							
TORFAEN:	1 (L)	90.70	NOT AVAILABLE			25. 9.82	5.00+
(CWMBRAN (TC)	(1 (L))		N/A			(25. 9.82)	(5.00+)
HAMPSHIRE:							
BASINGSTOKE	4 (M)	32.10	78.79		0.61	4.12.81	631.30
EASTLEIGH	5 (L)	17.98	128.72		1.43	3. 6.80	2 217.04
FAREHAM	3 (L)	28.60	54.66		0.64	23.12.80	520.14
E HAMPSHIRE	1 (L) 1 (M)	43.50	80.42		0.92	25.11.80	1 115.30
HART	1 (M)	75.50	20.34		0.27	19.12.83	211.16
HAVANT	4 (L)	29.00	74.34		0.64	7. 2.82	572.72

KEY

The majority of Councils weigh their Bottle Bank containers as they are emptied but, the remainder are indicated as follows, because the Councils:

* Obtain their figures from the recycling plant + Estimate their figures

COUNTY/DISTRICT COUNCIL	NO OF SITES (L= LARGE) (M=MODULAR)	POP PER SITE ('000s)	TONNES COLLECTED BOTTLE BANKS	OTHER SOURCES	KG PER HEAD POP.	SCHEME LAUNCHED	TOTAL TONNAGE TO DATE
HAMPSHIRE ....../	contd						
NEW FOREST	6 (L)	23.93	154.44		1.08	3. 8.81	1 373.75
PORTSMOUTH	5 (L)	37.74	71.16		0.38	12.11.80	1 076.30
RUSHMOOR	5 (M)	16.30	80.66		0.99	1.10.80	1 056.73
SOUTHAMPTON	6 (L)	34.38	171.54	16.92	0.83	17. 7.80	3 320.36
TEST VALLEY	2 (L)	46.65	112.56		1.21	4. 6.80	1 965.92
WINCHESTER	3 (L)	29.83	75.06		0.84	13.11.79	1 591.92
HEREFORD & WORCS:							
HEREFORD	1 (L)	47.00	83.85*	2.75*	1.78*	6.10.82	286.41*
MALVERN HILLS:	1 (L) 4 (M)	16.72	26.29		0.32	18. 5.84	65.65
(LEDBURY TC)	(1 (L))		(12.30)			(1.10.81)	(51.66)
LEOMINSTER	1 (L)	37.50	18.00		0.48	31. 3.83	62.43
WORCESTER	11 (M)	6.81	71.04		0.95	16. 2.84	89.94
WYCHAVON	3 (L)	30.83	99.53*		1.08*	25.10.82	277.45*
WYRE FOREST	6 (L)	15.30	73.50		0.80	3.12.79	1 512.93
HERTFORDSHIRE:							
ST ALBANS	12 (M)	12.18	155.75		1.07	9. 7.82	1 092.04
BROXBOURNE	7 (M)	11.37	67.80		0.85	7.12.82	394.06
DACORUM	5 (L) 9 (M)	9.28	172.13	1.98	1.34	13. 5.80	2 485.00
E HERTS	7 (M)	15.51	133.35		1.23	10. 6.82	983.19
N HERTS	9 (M)	11.76	175.25		1.66	15. 1.82	1 620.43
HERTSMERE	5 (M)	17.60	62.29		0.71	12.10.82	488.65
STEVENAGE	9 (M)	8.22	81.70		1.10	5. 5.82	699.57
THREE RIVERS	5 (L) 5 (M)	7.73	101.33		1.31	3.10.80	1 726.14
WELWYN/HATF'LD	11 (M)	8.45	130.50		1.40	13. 1.82	1 231.93

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BOTTLE BANK PROGRESS REPORT

COUNTY/DISTRICT COUNCIL	NO OF SITES (L= LARGE) (M=MODULAR)	POP PER SITE ('000s)	TONNES COLLECTED BOTTLE BANKS	OTHER SOURCES	KG PER HEAD POP.	SCHEME LAUNCHED	TOTAL TONNAGE TO DATE
HUMBERSIDE:							
BEVERLEY	8 (M)	13.34	45.36		0.43	25.11.83	104.48
CLEETHORPES	7 (M)	9.74	30.50*		0.45*	15. 9.82	165.24*
GREAT GRIMSBY	9 (M)	10.20	42.98*		0.47*	15. 9.82	292.47*
HOLDERNESS	7 (M)	9.02	19.54*		0.31*	28. 9.83	51.10*
KINGSTON U'HULL	39 (M)	7.05	93.10*		0.34*	27. 4.83	489.35*
E. YORKSHIRE	12 (M)	6.13	51.95*		0.71*	8. 6.83	197.39*
HUMBERSIDE:							
(SCUNTHORPE)	12 (M)	5.57	24.62*		0.37*	7. 9.77	640.26*
(GLANFORD)	7 (M)	9.29	22.78*		0.35*	11. 1.83	86.49*
ISLE OF WIGHT:							
(MEDINA)	6 (L) 3 (M)	14.51	135.75+	5.25+	) 1.04+	4.1.83)	622.00+
(S WIGHT)					)	14.2.83)	
KENT:							
ASHFORD	3 (L)	28.04	33.08*		0.39*	21. 4.82	333.75*
CANTERBURY	3 (L) 6 (M)	13.35	80.90*		0.67*	4. 2.82	654.34*
DARTFORD	1 (L) 2 (M)	27.07	48.12*		0.59*	28. 5.82	359.48*
DOVER	9 (M)	11.06	40.48*		0.41*	15.12.83	80.61*
GRAVESHAM	2 (L)	48.10	73.40*		0.76*	29.11.80	1 146.91*
KENT:							
(GILLINGHAM)	2 (L)	63.50	77.92		0.61	5.81	(585.22+)
MAIDSTONE	5 (L)	25.90	91.85		0.71	3.11.80	(1 156.71+)
ROCHESTER U MED	3 (L)	49.40	45.12		0.30	21. 2.80	558.76
SEVENOAKS	2 (L) 4 (M)	18.22	72.03*		0.66*	6.10.80	1 335.95*
SHEPWAY	32 (M)	2.64	78.03*		0.92*	15. 7.82	658.43*
SWALE	3 (L)	35.90	79.03		0.73	27.11.81	N/A
THANET	6 (M)	19.99	36.13*		0.30*	12.12.83	74.39*
TONBRIDGE & M	2 (L) 2 (M)	23.00	82.55*		0.90*	18.11.82	301.59*
TUNBRIDGE WELLS	4 (M)	23.85	46.83*		0.49*	24. 3.81	1 069.01*

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LANCASHIRE:							
BLACKBURN	3 (L)	47.13	22.05		0.16	23. 2.81	403.55
BLACKPOOL	1 (L)	143.30	10.43		0.07	23.11.81	87.93
BURNLEY & DCU	1 (L)	90.70	11.34		0.13	7. 5.83	39.44
FYLDE	2 (L)	33.70	25.16		0.37	16. 6.82	180.30
LANCASTER	23 (M)	5.35	90.12*		0.73*	9. 3.83	520.72*
W LANCASHIRE	10 (M)	10.84	49.58*		0.46*	15.12.83	92.10*
PENDLE	4 (L)	21.20	26.34		0.31	2.12.80	390.48
RIBBLE VALLEY	1 (L)	52.80	15.96		0.30	26. 8.82	99.15
S RIBBLE/CHRLY	5 (L)/5 (L)	18.71	104.03*		0.56*	14. 4.79	2 235.60*
ROSSENDALE	1 (L) 3 (M)	16.03	26.51		0.41	12. 3.81	325.04
WYRE	3 (L)	32.70	56.50		0.58	22.12.81	415.07
LEICESTERSHIRE:							
HINCKLEY & B	4 (L)	21.73	39.20		0.45	3.12.80	620.05
LEICESTER	8 (L) 4 (M)	29.60	227.98		0.64	2.12.80	2 555.71
LINCOLNSHIRE:							
BOSTON	9 (M)	5.74	34.82*		0.67*	8. 4.83	184.83*
SOUTH HOLLAND	12 (M)	5.00	44.61*		0.74*	15.12.82	331.51*
N KESTEVEN	4 (M)	39.80	28.61*		0.18*	7. 3.83	99.34*
S KESTEVEN	12 (M)	7.87	89.93*		0.95*	28. 6.83	265.80*
LINCOLN	4 (L) 4 (M)	9.00	56.58*		0.79*	23.10.79	1 138.00*
E LINDSEY	9 (M)	11.40	60.14*		0.59*	21. 9.82	405.59*
W LINDSEY	4 (M)	19.38	23.22*		0.30*	14.12.82	116.20*

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BOTTLE BANK PROGRESS REPORT

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LONDON:							
BARKING & DAG	1 (L) 7 (M)	18.65	36.37		0.22	27. 2.84	47.77
(GLC)	(1 (L))(7 (M))		(36.37)			(27. 2.84)	(47.77)
BARNET	5 (L)	57.84	158.28		0.55	25.11.79	2 566.59
(GLC)	(2 (L))		(38.23)			18. 9.83	(46.63)
BRENT	8 (L)	31.48	107.28		0.36	15.10.79	2 711.54
(GLC)	(1 (L))		(1.00)			15. 6.84	(1.00)
BROMLEY	2 (L)	145.15	43.88		0.15	(1. 1.83)	110.60
(GLC)	(2 (L))		(43.88)				(71.38)
CAMDEN	6 (M)	31.07	53.50		0.29	11. 3.83	342.50
CROYDON	7 (M)	45.59	37.13*		0.12*	8. 3.84	42.38*
EALING	7 (L) 5 (M)	23.60	225.34*	14.55*	0.83*	23. 7.80	2 849.70*
(GLC)	(1 (L))		(17.50)			25. 3.83	(44.90)
ENFIELD	1 (L) 16 (M)	15.28	205.03		0.84	7.10.82	1 360.47
(GLC)	(1 (L))		(26.93)			(16. 5.83)	(71.95)
GREENWICH	5 (L)	41.08	169.41		0.82	19.11.79	2 733.45
HACKNEY	8 (M)	23.88	27.30		0.14	28. 1.84	36.00
(GLC)	(8 (M))		(27.30)			(28. 1.84)	(36.00)
HARINGEY	8 (M)	27.68	52.84		0.24	2. 2.84	67.44
(GLC)	(8 (M))		(52.84)			(2. 2.84)	(67.44)
HARROW	6 (L)	32.77	121.04		0.62	15. 7.80	2 778.36
HAVERING	1 (L) 12 (M)	18.45	195.35		0.92	1. 7.82	1 366.23
(GLC)	(1 (L))		(24.96)			1. 9.83	(33.66)
HILLINGDON	5 (L)	39.51	82.22*		0.30*	13.10.80	1 088.75*
(GLC)	(2 (L))		(58.02)			(7.11.82)	(88.91)
HOUNSLOW	7 (L)	28.80	156.66		0.37	28.11.80	2 385.04
(GLC)	(1 (L))		(17.76)			8. 8.83	(50.71)
ISLINGTON	10 (M)	16.97	92.46		0.54	21. 8.84	141.66
(GLC)	(10 (M))		(92.46)			(21. 8.84)	(141.66)

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LONDON: ....../ contd							
KINGSTON	1 (L) 7 (M)	22.58	118.53*		0.76*	20. 9.82	1 266.16*
(GLC)	(1 (L))		(19.14)			31. 1.84	(28.44)
LEWISHAM	8 (M)	29.78	90.96*		0.38*	5. 5.82	681.86*
MERTON	2 (L) 6 (M)	20.10	89.43		0.92	7.12.81	1 110.91
(GLC)	(2 (L))		(58.76)			(4. 9.83)	(86.01)
NEWHAM	1 (L) 11(M)	18.81	36.68		0.19	16. 3.84	69.34
(GLC)	(1 (L))(11(M))		(36.68)			2.11.82	(69.34)
REDBRIDGE	8 (M)	28.21	100.70		0.45	31. 8.84	146.85
RICHMOND	8 (L)	20.00	272.63*		1.70*	9. 4.80	4 416.69*
SUTTON	3 (L)	55.67	40.84*		0.25*	27. 5.82	419.89*
WANDSWORTH	6 (M)	45.31	20.32		0.07	1. 3.84	23.52
WALTHAM FOREST	7 (M)	31.11	36.36		0.17	7. 6.81	332.25
(GLC)	(7 (M))		(36.36)			(1. 3.84)	(48.76)
LOTHIAN:							
EDINBURGH	21 (L)	21.71	226.50	84.66	0.61	6. 9.78	7 086.71
EAST LOTHIAN	3 (L) 11 (M)	5.61	63.71		0.81	25.10.80	345.12
MID LOTHIAN	1 (L) 2 (M)	28.27	21.55		0.25	16. 6.80	255.23
WEST LOTHIAN	6 (L)	22.07	25.99	30.20	0.42	20. 6.80	874.49
GRTR MANCHESTER:							
BOLTON	7 (L)	37.17	127.12	22.35	0.49	9.11.78	2 735.82
BURY	11 (M)	16.25	52.75		0.30	19.10.82	363.53
MANCHESTER	11 (L)	43.10	118.01		0.25	15. 9.80	1 548.59
OLDHAM	11 (L)	20.31	95.52		0.43	25. 4.80	2 032.97
ROCHDALE	12 (M)	17.40	59.21*	1.74*	0.29*	23. 2.83	290.41*
SALFORD (VG)	9 (M)	27.77	37.56*		0.18*	23. 2.83	146.55*
STOCKPORT	13 (M)	22.33	193.15*		0.67*	9.11.81	1 798.63*
TAMESIDE	7 (L) 10 (M)	12.78	127.98*		0.59*	10.12.80	1 567.32*
TRAFFORD	3 (L)	74.17	64.19		0.29	12. 5.81	702.95
WIGAN	3 (L)	103.43	11.80*		0.04*	28. 5.81	150.32*

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MERSEYSIDE:							
LIVERPOOL	4 (L)	128.38	NOT AVAILABLE			31. 7.83	N/A
ST HELENS	7 (L)	26.87	76.31		0.41	12. 3.80	1 174.87
WIRRAL	7 (L)	48.60	78.24		0.23	1.10.81	926.39
WEST MIDLANDS:							
BIRMINGHAM	7 (L)	147.19	271.80		0.26	13. 4.81	1 907.67
COVENTRY	6 (L)	56.37	83.35		0.25	30. 9.82	185.98
DUDLEY	6 (L)	49.40	200.85		0.68	18. 3.80	3 306.07
WEST MIDLANDS:							
(WALSALL)	10 (L)	51.91	100.30		0.19	29.10.82	355.18
(WOLVERHAMPTON)						29.10.82	
NORFOLK:							
KING'S LYNN & W	4 (M)	29.98				12.82	
NORFOLK:							
(BRECKLAND)							
(BROADLAND)							
(N NORFOLK)	8 (L)	59.56	168.61*		0.35*	28. 5.80	2 160.03*
(S NORFOLK)							
(NORWICH)							
(GT YARMOUTH)							
NORTHAMPTONSHIRE:							
DAVENTRY	1 (L)	56.70	21.48		0.38	10. 6.80	459.35
KETTERING	1 (L)	71.00	20.59		0.29	18. 2.81	356.28
NORTHAMPTON	8 (L)	19.73	157.75	73.39	1.06	20. 6.78	4 789.90
S NORTHAMPTON	2 (L)	31.85	26.18		0.57	12. 6.80	282.75
(BACKLEY T.C)	(1(L))		(10.30)			11.83	(20.03)
WELLINGBOROUGH	1 (L)	63.80	31.48		0.49	15. 4.80	619.80

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NORTHUMBERLAND:							
ALNWICK	1 (L)	27.40	NOT AVAILABLE			18. 8.81	156.88*
BLYTHE VALLEY	2 (L)	38.55	NOT AVAILABLE			23.11.81	87.58*
NOTTINGHAMSHIRE:							
ASHFIELD	4 (M)	26.35				28. 4.83	
BASSETLAW	4 (L)	24.83	41.70		0.42	6.10.80	652.22
BROXTOWE	4 (M)	25.58				28. 6 83	
GEDLING	5 (M)	20.64	43.30		0.42	11. 4.83	N/A
MANSFIELD	2 (L)	49.50	24.89		0.25	2. 9.81	224.46
NEWARK	4 (M)	25.18	31.90		0.32	21.12.82	N/A
NOTTINGHAM	4 (M)	69.15				13.12.83	
RUSHCLIFFE	4 (M)	21.78	35.30		0.41	15. 8.83	N/A
OXFORDSHIRE:							
CHERWELL	4 (L)	28.23	76.59		0.68	13. 5.81	920.47
SOUTH OXFORD:	2 (M)	67.55	54.79		0.41	4.12.81	618.15
(HENLEY TC)	(2 (M))		(54.79)			(4.12.81)	(618.15)
OXFORD	6 (L)	20.33	122.48		1.00	24. 8.77	4 453.87
W OXFORD	6 (L)	13.15	50.39		0.64	6.11.80	822.08
VALE W HORSE	3 (L)	32.07	51.49		0.54	27. 4.81	583.86
SHROPSHIRE:							
BRIDGENORTH	1 (L) 4 (M)	9.56	16.68		0.35	2. 4.84	16.68
N SHROPSHIRE	2 (L)	24.65	32.00+		0.65+	15. 1.83	148.00+
THE WREKIN	5 (L)	24.90	30.42*		0.24*	11. 4.80	771.98*
SOMERSET:							
YEOVIL	1 (L)	130.40	NOT AVAILABLE			23. 5.84	N/A
(YEOVIL TC)	(1 (L))		N/A			(23. 5.84)	(N/A)
STAFFORDSHIRE:							
CANNOCK CHASE	3 (L)	27.80	30.50		0.37	1.11.82	167.41
LICHFIELD	3 (L)	28.80	40.54		0.47	1.11.82	196.95
(BURNTWOOD)	(2 (L))		(17.52)			(14. 2.83)	(62.09)
STAFFORD	5 (L)	22.84	68.63		0.60	1.11.82	356.61
E STAFFS	1 (L)	93.80	17.80		0.19	26. 4.82	279.57
STOKE-ON-TRENT	15 (M)	17.11	9.10		0.04	25. 5.84	9.10

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			BOTTLE BANKS	OTHER SOURCES			
STRATHCLYDE:							
BEARSDEN & M	2 (L)	19.55	33.21		0.85	16. 5.81	374.80
CLYDEBANK	1 (L)	51.80	3.46		0.07	10. 8.82	29.00
CUMBERNAULD & K	2 (M)	32.30	3.26*		0.05*	6. 6.83	16.48*
CUMNOCK & D V	1 (L)	45.80	3.59		0.08	10.12.81	38.97
CUNNINGHAME	2 (L)	67.95	11.84*	8.00*	0.15*	20. 1.81	152.04*
DUMBARTON	3 (L)	26.50	65.43*		0.41*	31.10.80	352.50*
EASTWOOD:	2 (L)	29.95	19.18		0.32	13. 8.80	424.07
(MUIREND)	(1 (L))		(10.28+)			(2.12.81)	(147.77+)
(N MEARNS)	(1 (L))		(8.90*)			(13. 8.80)	(276.30*)
GLASGOW	6 (L) 33 (M)	20.03	132.96		0.17	26. 3.79	2 643.67
HAMILTON	3 (L)	23.89	13.69		0.19	1.11.80	237.94
INVERCLYDE	6 (L)	16.80	27.07*		0.27*	16. 4.80	358.94*
E KILBRIDE	6 (L)	13.78	47.60		0.58	3.10.80	528.05
KILMARNOCK	1 (L)	81.60	12.19		0.15	4. 6.81	159.00
KYLE & CARRICK	6 (L)	18.73	36.52		0.32	22. 4.83	123.89
MONKLANDS	2 (L) 7 (M)	12.14	22.87		0.21	25. 6.80	206.25
MOTHERWELL	2 (L)	75.35	14.19		0.09	29.10.82	32.00
RENFREW	7 (L)	30.64	21.78	19.87	0.19	18.12.80	538.53
STRATHKELVIN	2 (L) 2 (M)	21.83	7.14*		0.08*	8. 4.81	294.99*
SUFFOLK:							
BURY ST EDMUNDS	4 (M)	(21.60)	15.75		0.18	31. 5.83	N/A
FOREST HEATH	4 (M)	(14.45)				11. 5.83	
WAVENEY	10 (M)	(9.83)	30.00	5.00	0.86	8. 3.83	N/A

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			BOTTLE BANKS	OTHER SOURCES			
WARWICKSHIRE:							
NUNEATON & BED	5 (L) 1 (M)	18.48	65.01	4.74	0.59	5.12.80	946.42
RUGBY	4 (L)	21.00	38.82*		0.46*	6. 8.80	989.21*
STRATFORD	4 (L)	24.88	116.16		1.17	11.12.80	972.75
WARWICK	15 (M)	7.75	76.23		0.66	11. 4.84	76.23
N WARWICKSHIRE	3 (L)	19.80	39.41		0.66	5.12.80	508.02
WILTSHIRE:							
THAMESDOWN	10 (M)	14.44	NOT AVAILABLE			6. 6.84	N/A
N WILTSHIRE:	1 (L)	107.20	19.60*		0.18	4. 9.80	326.37*
(W BASSETT)	(1 (L))		(19.60*)			(4. 9.80)	(326.37*)
SALISBURY	2 (L)	51.90	117.23*		1.13*	12.12.79	2 067.12*
NORTH YORKSHIRE:							
CRAVEN	4 (M)	11.88	11.76		0.25	26. 4.84	11.76
HAMBLETON	5 (M)	14.84	13.63*	2.14*	0.21*	(11. 5.84)	21.37*
HARROGATE	2 (L)	67.15	43.83		0.33	3. 5.81	357.45
RYEDALE	4 (L)	20.63	33.66		0.41	2. 4.80	415.36
SCARBOROUGH	3 (L)	33.13	41.80		0.42	9. 1.81	681.86
SELBY	6 (M)	13.46	17.60*		0.22*	9. 9.83	50.76*
YORK	4 (L) 11 (M)	6.71	77.44*		0.77*	17. 7.78	2 182.14*
SOUTH YORKSHIRE:							
(BARNSLEY)							
(DONCASTER)	25 (L) 12 (M)	35.22	247.16*		0.19*	24.8.77	4 914.56*
(ROTHERHAM)							
(SHEFFIELD)							
WEST YORKSHIRE:							
BRADFORD	8 (L) 24 (M)	14.45	120.80	24.65	0.31	4.12.79	1 858.61
CALDERDALE	8 (L)	23.57	93.95*		0.50*	27.11.80	863.95*
KIRKLEES	5 (L)	76.08	82.09		0.22	19. 9.79	1 125.66
LEEDS	18 (L) 38 (M)	13.17	373.41*	63.77*	0.59*	12. 9.78	7 232.55*
WAKEFIELD:	11 (L)	28.26	59.30*		0.19*	30 .7.80	1 082.40*
(KNOTTINGLEY)	(3 (L))		(10.00*)			(7. 3.80)	(245.49*)

KEY

The majority of Councils weigh their Bottle Bank containers as they are emptied but, the remainder are indicated as follows, because the Councils:

* Obtain their figures from the recycling plant + Estimate their figures

PGM/TI/PGM015

Appendix C.

C.2. Rockware Reclamation

Rockware have been a main participant in the promotion of the Bottle Bank scheme, since the scheme for reclamation of glass containers was introduced in 1977. They have established a plant at Knottingley for processing this source of 'raw material'. Figure C.2 shows a schematic of how the recycling plant works.

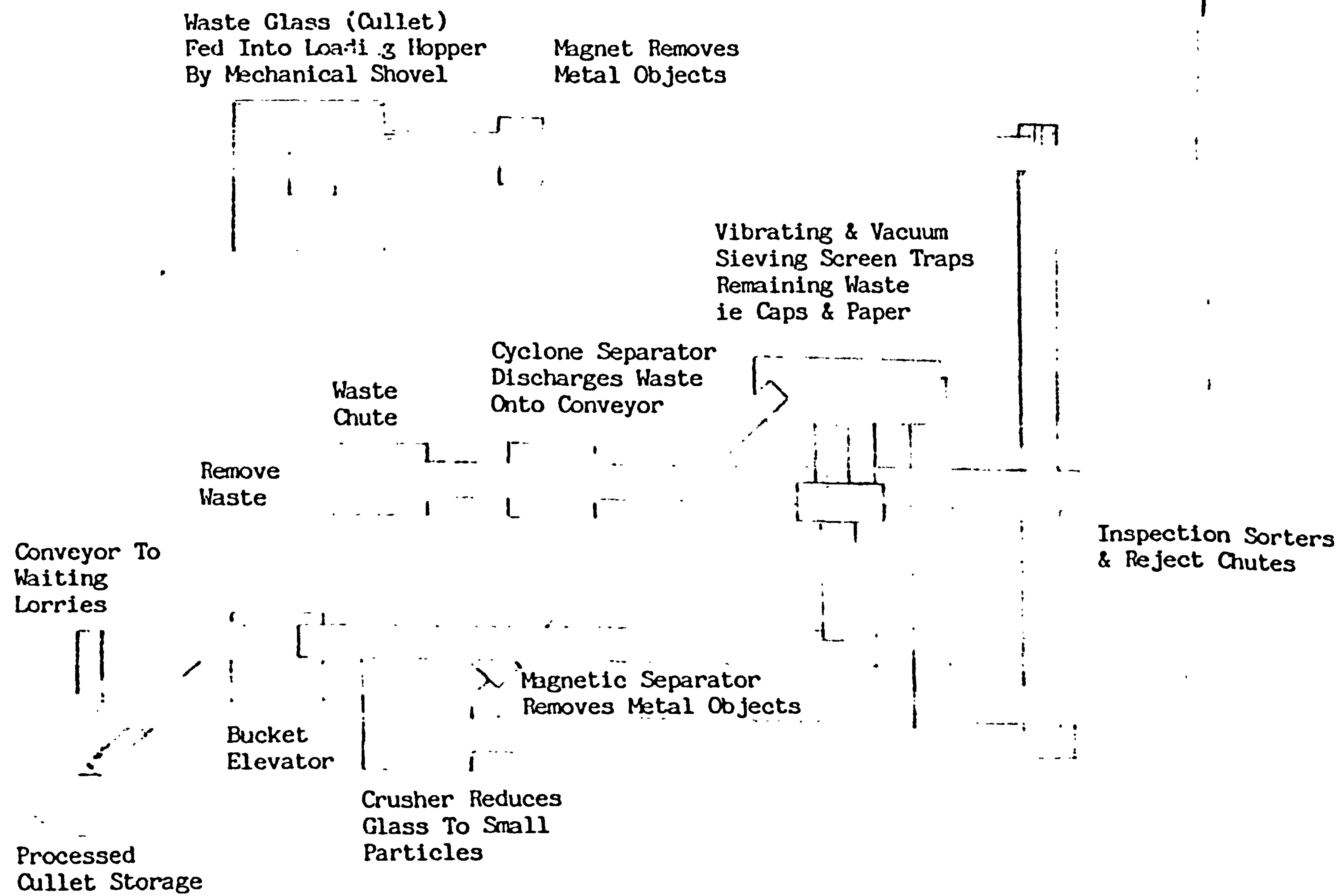
Rockware has established a leading role in the collection and processing of waste glass. They see a number of opportunities which will result in profitable new business by making use of skills and resources already acquired in glass recycling. They have well established relationships with over 140 Local Authorities.

It is Rockware's intention to expand its reclamation activities to other materials and to take advantage of a marketing potential that, having regard to increasing environmental pressu.e, can only grow stronger in the future.

The pressure from substitute materials is strong but the glass container market of nearly 6000 million containers still dominates the container market. Rockware has 25% of this market and produces up to 5 million glass containers every day.

In 1984 the glass container industry increased its share of the packaging market by 1%, having lost share for some years (Rockware Accounts 1984). Rockware exercised its role as market leader in ending the price war which ran through 1983. Prices were raised in the Autumn of 1983 and again in May 1984. For the first time in many years, price increases covered cost increases.

Figure C.2 Rockware Glass Recycling Cents - How It Works



Key

Uncrushed Cullet

Crushed Cullet

Waste Material

SOURCE: INCPEN 'Figuring Out Rubbish' 1982

The Industry must learn to match demand and supply, as excess capacity still threatens the potential returns on new capital expenditure.

Sales increased by 6% from £101.3 million to £107.4 million. For the first time for four years total sales of glass containers increased. Imports, however, also increased, whereas exports fell, and this must be a cause for concern.

Two large and two small furnaces were rebuilt to schedule. One furnace at the Bagley site (10 years old) Knottingley, was not replaced at the end of its natural life.

C.3 Redfearn National Glass

Redfearn National Glass (RNG) has 15% of the market. RNG began restructuring in the 1970's to improve the viability of its operations. They closed their York plant concentrating production at Barnsley. This helped RNG produce an operating profit of £1.1 million in the year to September 30 1984, compared with a loss of £2.1 million (EADIE 1984). Turnover fell by 11% to £56.5 million following the consolidation of glass operations at a single plant.

Glass Production

The batch consists of sand, soda ash and limestone. Sand makes up 65% of the batch and melts at 1800°C. Soda Ash is added and melts at 1500°C. This combination forms 'water glass' (ENGLAND 1984). Limestone is then added as a flux which stabilises and binds the mix.

For white glass need an iron free sand (green tinge). Selenium (red) can be added, but it is expensive at £23,000 per tonne, and is imported from Australia and Canada. RNG receives fine sand from Kings Lynn (British Industrial Sands) who acid treat it before delivering to Barnsley.

The rest of the materials arrive as 'dust', and are stored in concrete silos which hold up to 6,000 tonnes.

The percentage of cullet used overall is about 10%, although in Europe some furnaces are running with 80% cullet. In the furnace 1.2 tonnes of raw materials produce 1 tonne of glass, whereas 1 tonne of cullet produces 1 tonne of glass.

For coloured glass, the sand used is of an inferior quality, and comes from North Derbyshire. To produce brown glass, carbon and sulphur is added to the batch in reducing conditions in the furnace. For green glass, chromium is added under oxidising conditions in the furnace.

Cullet of 1000 to 2000 tonnes is stored on site, and is added to the mix.

In the furnace, the cullet and raw materials are mixed to form the batch in the 'Dog House' section. A problem can occur if cullet is added too fast. As cullet melts quicker than raw materials and can be forced back, like a glacier - 'dog house freezes off'.

Process can use 3 types of fuel:

- heavy fuel oil - main - 25,000 gallons per day
- natural gas - softer on furnace
- electricity

Glass production is a continuous process with 5 furnaces working.

A problem with the use of cullet is the presence of contraries such as aluminium. Process on quality grounds can tolerate 0.01% aluminium by weight (equivalent to 10 bottle tops per tonne, or 200 bottle rings per tonne). Aluminium forms a silicate which can cause a flaw in the bottle which is then rejected under manual or mechanical quality checks.

RNG produce 250 different container types.

RNG - Reclamation

RNG carried out one of the first glass recycling trials in Britain, that looked at the economics of the separate collection of glass (Section 5.4). This was carried out in the City of York, in conjunction with the City Council. Within this trial they encountered a number of problems, with low participation rates, poor quality of recovered product, and high costs of collection. In fact the collection costs were three times the value of the glass product.

Following on from this trial, RNG began looking at other collection methods. Since 1972 Bottle Banks were being successfully used in Europe. In Britain, Bottle Banks were first introduced in August 1977, in Barnsley and Oxford. The siting of 12 cubic yard metal skips with 3 tonne capacity was based on 1 bank per 15,000 people.

The Bottle Bank scheme was set up in conjunction with District Councils as they already had the equipment to move Banks and were not involved with extra costs. The Banks were uplifted fortnightly to a central storage site. Here glass is bulked up until sufficient is available for onward bulk transport. Storage costs tended to be extra on the Council.

An initial problem was the level of noise, with the first Bottle that is dropped in producing 96 decibels of noise. Also Banks were not close enough to public to be effective.

In November 1981, RNG looked at a different scheme. They sought to establish a modular bank system. They chose Stockport for new launch, as the Council did not feel that it would be 'economic'. Stockport was 35 miles from the plant, was 10 miles square with a population of 300,000. The modular system chosen was based on the use of three GRP containers on each site (ENGLAND 1984). These cost £220 each, and were provided by RNG. The problem of noise is reduced, with the first Bottle causing 48 decibels of noise. It was also possible to site these closer to the public, with 1 bank per 6,000 people. The modular banks vary in size, dependant on the availability of colour.

Different Colours:

PUBLIC	INDUSTRY	BANK COLOUR	SIZE
Clear	White/Flint	White	2.5m
Brown	Amber	Brown	1.5m
Green	Green	Green	1.5m

Uplift is undertaken by a specialist lorry, that is divided into three compartments and is fitted with a crane (Costs £38,000). The crane has two hooks: 1 hook takes the weight of the bank, and the other keeps the door closed until the bank is over the lorry, when tension is released and cullet is emptied into the lorry. The vehicle has a detachable body with a multilift system. The existing lorry was used once a fortnight, now it is fully occupied. This collection service is carried out by Barnsley Waste Disposal Limited on a contractural basis for RNG.

The Council faces no capital outlay, but it is involved through choice of sites. The scheme is covered by an 'exchange of letters' rather than formal contracts. But contracts could be made available if they were required.

As the scheme has developed, it now fully utilises the lorry. This was a one off lorry design on 2 'Y' registered Scanners. The sites are arranged so that the lorry is fully utilised so that a maximum load is obtained on each trip. As a guideline: 45 banks (15 sites) give a 14 tonne payload. Normally, both banks and vehicles will be written off over a 5 year period.

RNG - Recycling Plant

The plant was built in July 1982, based on designs by Ron England. The plant is owned and run by Barnsley Waste Disposal Limited, but operates under guidelines from RNG. The plant lies about 2 miles from Redfearn's Bretton Works in Barnsley.

It is based on cullet being sent along a conveyor, through a building. The contraries are manually removed. The plant can process 15 tonnes of cullet per hour. This rate compares favourably with UGC's Harlow plant which can process 20 tonnes per hour.

In processing clear glass, brown and green cullet is removed by hand, along with aluminium, lead and plastic materials. Barnsley Waste Disposal are looking at the possible use of machinery to remove the aluminium.

The plastics recovered is sold off to local plastic manufacturers. The lead is also sold off. Any revenue from the lead, is paid as a bonus to the work force to encourage its removal.

Future Prospects

RNG seek to saturate their area of operations with Bottle Banks as quickly as possible. At present (January 1984) 75% of the area is covered. They are also developing a 'mobile bank' ($0.9m^3$) for large restaurants and hotels. They also intend to examine ways of recovering glass from their own customers.

RNG feel that publicity in its self is of limited value, and that the siting of new Banks is of greater importance.

C.4 Private Firms Operating Glass Collection Schemes

1. Anti-Waste Ltd
   Park Farm
   Fornham St Genevieve
   Bury St Edmunds
   Suffolk IP28 6TS

   Mr Paul Rackham

   System: Modular
   Area: Suffolk, Norfolk.

2. Barnsley Waste Disposal Ltd
   Carlton Road
   Barnsley
   South Yorkshire

   Mr Trevor Sykes

   Main Contractor to Redfearn National Glass

   System: Large/Modular
   Own Recycling Plant
   Area: York, Manchester, Lincolnshire, Humberside.

3. Berryman & Sons Ltd
   3 Bittern Court
   Connaught
   Chingford
   London E4 7UF

   Mr Fred Berryman

   Own Recycling Plant

4. Bideford Metals Ltd
   Old Barnstable Road
   Bideford
   North Devon

   Mr Goddard

   System: Large Banks
   Area: Devon scheme.

5. CG Recycling
   125 Aberdeen Street
   Paisley
   Glasgow

   Mr Jim Morrettie

6. Cleanaway Ltd
   Waste Services Division
   London Region Office
   88 Swales Lane
   Woodford Green
   Essex 1G8 7HX

   Mr Roger Heckford

   System: Modular Banks
   Area: Essex, Herts, Cambs, Suffolk.

7. End Moore Ltd
   Shiralee
   Catesbeck Road
   Endmoore
   Cumbria MA8 0HL

   Mr L A Wilson

8. Envirobins Ltd
   1 Turpington Lane
   Bromley
   Kent BR2 8JA

   Mr D A Robbins

   System: Small Banks
   Area: Surrey

9.	Fyld Cullet Merchants Beacon Road Poulton-Le-Fylde Poulton Industrial Estate Nr Blackpool Lancashire	Mr P Morganhome System: Small Area: Fyld, Blackpool
10.	GFT Glass Recyclers 5 Church Lane Ash Wicken Kings Lynn Norfolk NE32 1NE	Mr A Gent System: Modular Area: Suffolk, Norfolk, Cambs, Lincs.
11.	Falkirk Glass Recycling Company Burn House Basin Falkirk	Mr T McCarrol System: Large Banks Area: Scotland
12.	Hodgson Cullet Merchant 17 Leofric Square Vicarage Farm Road Peterborough Cambs	Mr M G Hodgson System: Area: Peterborough City
13.	Roger Hughes & Co Ltd Llysfaen Road Old Colwyn Clwyd North Wales	Mr R Hughes System: Area: Colwyn Bay
14.	Taylors Glass & Waste Recycling Dale Road Industrial Estate Worthing West Sussex BN11 2RN	Mr Burroughs System: Modular

C.5.1 Glass Recycling Company Of Falkirk

The Glass Recycling Company is one of a group of three companies involved in waste disposal. This group moved into glass recycling in December 1980 after approaches from United Glass (GILLIES 1983). United Glass were looking for someone to haul broken glass. From this introduction, the Glass Recycling Company were encouraged to initiate glass recovery schemes in combination with Local Authorities. The Company has established links with several Local Authorities and has sites at:

Cumnock & Doon Valley
Dunbar
East Lothian
Kilmarnock & Loudoun (2 sites)
Lugar (1)
Motherwell District (2)
Musselburgh
North Berwick

Kilmarnock & Loudoun have since taken over the operation of the recycling scheme from the Comany (ANON 1984).

The Company has no specific contract with Local Authorities, but have an agreement to pick up the banks. They give a return to Local Authority of £2 to £3 per tonne of glass recovered. The role of the Council is to monitor sites and notify the Company when the Banks are almost full. The Council also takes responsibility for maintaining the site.

The company view is that privatisation will not have an affect on their activities. They believe that as glass is 'not' a waste product but a re-usable material, changes in collection practice is unlikely to affect the recovery of glass.

The Company's criteria for establishment is that a scheme be profitable. The Company makes a marginal profit on 50% of the sites they operate. They view the Bottle Bank system as:'a complete waste of time' and are now discussing withdrawal from several sites.

A problem with the sites the Company services is their distance from the company's Falkirk depot. The major costs they found are: transport and wages, accounting for 90% of their costs. For example, to service Dunbar takes 1.5 hours as they take empty skip to site, swap for full skip, which is delivered to processor and then lorry returns the empty skip to the depot.

Bottle Banks (2.5-3 tonnes) cost £700 each and the Company feels that these are not large enough to spread transport costs effectively. They are looking at Banks with a capacity of 8-10 tonnes. Although, an extra capital cost, it allows transport costs to be spread over a greater tonnage.

Some problems of operating the scheme, is the damage to the Banks through: vandalism, graffiti and break padlocks.

C.5.2 Operating Costs

The Glass Recycling Company were unwilling to give specific operating costs. They use their own skips costing about £700 each and need to provide costs for upkeep and replacement. They expect Bottle Bank costs should be recovered over 4 years and should last 10 to 20 years if properly maintained. They have to consider likelihood of damage from own drivers and from vandals.

C.5.3 Collection System

The Company uplifts full skip from the site, leaving an empty skip and deliver to processor at Alloa. Labour is 1 driver who is paid above standard haulage rates, with hours depending on distance to sites. They use their own vehicles (A skip lifter costs £22,000+ each). The Company depreciates over 4 years, after this time they are likely to face expensive repairs. Examples of costs are: MOT (Spares, 1 week, 2 men:£500 per annum), License(£800 to £900 per annum), Insurance, Petrol and Tyres.

Some of the problems of haulage, are cannot always get trucks to Bottle Banks in busy car parks. This may necessitate servicing a site early in the morning and incur overtime costs. For example: Falkirk, transports 2.5 tonnes of glass over 10 miles, costed at approximately £10 per tonne. This means transport costs are £25, with revenue of £50.

C.5.4 Storage System

The company has no storage and takes skips straight to Alloa to empty and then returns them to the Falkirk depot. Occassionally, the Company can get a large load of Bottles in boxes, from fillers who have surplus stock. These are taken to the Falkirk depot and bottles are hand sorted into skips, which are then delivered to Kelliebank.

C.5.5 Other Costs

Other costs incurred are advertising and administration. Advertising costs are a marginal expense. Administration overheads are allocated so much per quarter, as part of overall costs of the Group of three companies.

C.5.6 Tonnages Collected

The Company handles 500 tonnes of glass per month. About 5% of this is from Bottle Banks (25 tonnes), 10-15% from glass haulage and the rest is purchased and delivered.

C.5.7 Future Developments

Future developments of glass recycling are limited and will diminish unless get alternative sources of glass. With this trend away from glass to plastics packaging, have to look at other bulk sources.

GILLIES (1983) viewed Bottle Banks as a commercial 'White Elephant' and to some degree as a public relations exercise.

The average skips the Company uses have an average weight of 4.5 to 5.0 tonnes. Whereas, Bottle Banks are half the size and these containers are expensive. It would be better if can use larger skips (8 tonnes). Also, look at the possibility of charging Local Authorities for the 'service'. They also thought that a modular system is unlikely to be successful.

Falkirk considered setting up a scheme for hotels, but would offer no payment and the cost of servicing is likely to be prohibitive. It would be marginally profitable with costs of labour, containers and transport needing to be clearly assessed. An average pub fills skip about twice a year, suggests the use of a 45 gallon drum. But if they do not break bottles they take up a lot of space and lead to the transportation of a lot of air. One answer would be to install a crusher (£15,000), but this would increase collection costs as would have to transport first to Falkirk and then on to Alloa. Decision to invest would require a more favourable price. With hotels and pubs storage and safety aspects need to be considered. There will need to be restricted access to the Banks from the general public. With costs of National Insurance, Taxes, such a scheme is likely to be prohibitive.

C.6.1 Cleanaway Limited

Cleanaway Ltd is the largest private waste disposal company in Britain, with a turnover of £30 million and a national network of service centres (TARRANT 1982). With the opening of United Glass' recycling plant at Harlow, Cleanaway examined the possibility of setting up a glass recovery programme.

In considering establishing a recycling scheme, the key factor to assess was transport costs. It was decided that the optimum distance was a catchment area with a radius of 50 miles centred on Harlow. There would be no storage and subsequent bulk delivery as this would add to the transport costs. Also, such a system would not fit in with the company's transport fleet, as it did not run any 20 tonne bulk tippers.

To overcome these problems Cleanaway developed a lorry that could carry 15 tonnes of glass, that has been collected from several sites and is delivered direct to Harlow. The system is based on modular banks, with the first sites being established at Welling and Hatfield in January 1982. Cleanaway, now serves sites (188) in 20 boroughs using 402 modular banks. The main areas covered are: Cambridge, Hertfordshire, Essex and the London Boroughs.

C.6.2 Setting Up

Before setting up, Cleanaway circularised relevant local councils outlining the company's proposals for the scheme and what they expected from the council. These are outlined below:

Cleanaway would offer:

1. 3 Bnks for clear, green & brown glass.

2. A weekly collection service, at no cost to the Council.

3. Rebate to Council, dependant on distance and tonnage collected - with no difference for coloured glass.

If the Council would:

A. Pin-point at least 10 sites, that would each generate 1 tonne of glass per week.

B. Take responsibility for compliance with relevant Planning Acts.

C. Maintain the site.

D. Publicise the scheme.

Once the interested Councils had been identified they were brought to a meeting for more specific discussions on the scheme.

The Councils put forward sites which were reviewed for:

1. Population levels - to produce required tonnage.
2. Vehicle access - loading
3. Nearness to residents - noise nuisance.
4. Hazard to public - children.
5. Easy for users to reach, away from busy roads.
6. Avoids grass verges - glass trodden in, can cause hazard to children - tarmac site.

Cleanaway then returns to Council with suggested sites and bank locations. Council liases with necessary departments for planning permission.

Cleanaway seeks a 3 to 5 years agreement with the Council, to collect and service sites. This is to ensure the company's investment is secure. However, they feel that if they offer a good service, there is little fear of losing the contract.

It is not thought that privatisation will have an effect on the Company's operations, as they operate successfully in Southend, where Exclusive have the waste collection contract.

The criteria for establishment is profitability, with decisions to be justified to shareholders. They found the scheme to be marginally profitable. In addition, it maintains the Company image and advertises the rest of the company's operations.

Also: Environmentally - people need to save
prevents waste of resources
saves scarce landfill space
saves energy for industry.

Benefits everyone - person who uses bank
- Council/Industry (Energy)
- Provides jobs

C.6.3 Cleanaway Scheme

Cleanaway operates at 188 sites with 402 modular banks within a 50 mile radius of Harlow (HECKFORD 1983). These sites are serviced by vehicles from depots at St Albans, Hertsfordshire and Rayleigh, Essex.

The system keeps colours separate. The economics is based on 1 tonne per week per site and a collection from 10 sites. Pick-ups are weekly as a rule, but some sites are serviced twice a week and others fortnightly dependant on the participation rate.

Collection is from the public, the company having no wish to set up specific private collections (eg from public houses), because:

a. there is little glass available,

b. it is unfair to the Council, if it loses revenue from trade waste charges.

If they do site at a Public House, the public must have easy access and any rebate goes to the Council. Other links with private companies were established before the Bottle Bank system started and the glass is bulk transported.

The outlet for the collected cullet is the UG plant at Harlow. Cleanaway have signed a 3 year contract with them (ANON 1983).

Cleanaway uses its own skips, that cost £300 each (an investment of £120,000) which are depreciated over 5 years. They are still on the learning curve with regards the life of bins. Although, in Germany modular banks have been reported to last between 6 to 8 years.

The Company is moving from Glass Reinforced Plastic (GRP) to Polyethylene (PE) made modular banks. GRP Banks are manufactured in Germany and are delivered 40 at a time costing £12,000. These then have to be stored before they are delivered to sites. This requires the use of a truck with a crane facility. Whereas, PE modular banks are manufactured in England and they will deliver 8 at a time, costing £2,400. These banks are lighter and can be delivered to the site by car and trailer and be man-handled into position. PE Banks are more robust. The colour is right the way through unlike with GRP Banks and will not scratch off. PE modular banks are easier to repair and maintain. They are also slightly cheaper and can looker neater on site.

C.6.4 Collection

Cleanaway, have designed a purpose built semi-trailer glass tipper to service the scheme. It is based on a 37 ft long frame and carries two 22 cubic yard welded steel bodies that tip independantly. It has been designed to keep colours separate. The lorry is loaded by an in-built crane. It is a 24 tonne vehicle that has a 15 tonne payload. It is a large lorry enabling the costs to be spread over larger tonnages.

At present collects 80-100 tonnes per week. There is a truck located at each depot and they are operated by one man. The vehicle costs £51,000 and is depreciated over 5 years. In addition there are: Road Fund License Costs at £2,500 and Insurance (38 tonne - £2,900 pa; 32 tonne - £2,200 pa), Wages at £200 per week and Maintenance and MOT (4 to 5 days work). Collection depends on back-up vehicles used for other purposes within the company. With the size and scope of the Company these are readily available.

C.6.5 Other Costs

Administration is separately accounted and is a minor part of the total costs. Assign administrative overheads and depot overheads of glass fleet to the recovery scheme. Advertising is met by a Department responsible for the whole of the company and through links with GMF and UG promotions.

C.6.6 Future

Possibly use roll-on-off vehicles and skips. These vehicles could be used for other services within the Company. This would provide a more versatile facility and spread the costs.

Cleanaway is approaching several more Councils. They are filling in the present area of operations. With the opening of Brent Terrace by the GLC looking to expand scheme to London Boroughs (ANON 1983b). If go South of the Thames, it would increase distance and would have to consider bulking at a central storage site.

No point in crushing, as can cause a weight problem.

C.7 Anti-Waste Limited

This is part of an existing waste disposal company that is involved in landfill operations. The company has established a separate Glass Recycling Division that integrates into existing units (RACKHAM 1985).

In the mid-1970's recycling became a topical issue. The Company met problems with attitudes of Local Authorities: some resistant, some helpful, influenced by public opinion.

Anti-Waste are looking to put scheme into Parish Councils. They found that the weight of glass per head collected was greater in the more rural areas than in the urban areas. They put this down to a more responsible and caring attitude. For example: Thetford (Population of 20,000) has two sets of Banks, but produces less glass per head than the town of Swaffham (population of 5,000) with 1 set of Banks.

Anti-Waste aim to establish a first class service, so it would be difficult for others to break into, so as to protect their investment.

Anti-Waste began operations in 1984. It is a question of capital costs - Modular Banks at £300 each - which need to be offset against sufficient glass collected. They site 1 bank at Hotels collecting colours as mixed, as to separate would need 3 banks at cost of £1,000. Unless they get a better return, they need to improve UG price (Monopoly). The Company has invested £60,000 into the scheme, and they need to maximise the utilisation of their equipment. This requires careful planning and routing of vehicles. They need a constant outlet for glass. Being dependant on one outlet is a high risk. In the first year will not breakeven.

The company operates the modular system with banks costing £300 each. At present they operate 14 sites with another 20 sites imminent. They are accounting costs over 5 years. They would welcome sponsorship.

Uplift is undertaken by a new lorry at a cost of £30,000 depreciated over 5 years. They do not breakdown costs: Standing costs account for 50%, and running costs 50%. At present the lorry is utilised to 25% of its capacity. The lorry is operated by 1 man, who cleans site after he has emptied the Bank. It operates on a milk-round principle, with collected glass taken to a central storage site at Thetford.

The routing and coordination are critical. Sites fluctuate in filling rates. Also should have a container for cardboard boxes, and plastic carrier bags.

Storage is provided at own site. Three bays are being constructed at present. Bulk transport is provided by spare capacity in existing vehicles. They have not broken down lorry costs, estimate at 75p per mile. They aim to carry 16 tonnes.

Publicity is carried out for each time they launch a new site. They promote in conjunction with UG, GMF, and issue circulars to the press.

The Company has a two year contract with Council. The Company tidies site when banks are emptied, in addition to routine maintenance by the Council. The Council receives £2 per tonne.

In addition Councils can negotiate for disposal rebate from WDA for every tonne of glass recovered (Suffolk pays £0.50 to £1.00 per tonne). The Councils pass part or all of money onto a local charity.

So far (March 1985) they have collected 80 tonnes of glass. They will breakeven when collect 50 tonnes of glass per week. The business has to pay its way. It shall put more emphasis on recycling - cardboard, metals, rags.

They have met a number of problems. It is difficult to know when Banks are full. On average pick-up when bins are 2/3 full. The lorry follows a round trip to maximise quantity picked up and thus spread costs.

There is a rural urban dichotomy. Rural sites are very effective in collecting glass per head of population. Need to fall into collection pattern.

They do not foresee a problem from competition. The glass recycling business is incorporated into existing business. They operate over a large area, and will begin to fill in. Local Authorities will not be able to offer as good a service and would cost more. They will not give the same service, and do not see the Local Authority moving in.

Providing purchaser (UG - monopoly) pays a fair price, it will be okay. Need to educate the Public and Local Authorities. This will be done by GMF, UG, Contractor and Local Authorities. There is a need to look at advertising Bottle Banks on refuse bags issued by Councils. Looking at Trade waste to see if there is a possibility of a system that would fit into existing collection pattern, but would charge for the service.

C.8 Envirobins

Envirobins is one of two entirely private companies that exclusively operates a Bottle Bank scheme and have no other waste collection operations. They began operations in 1980, in Surrey. Distance is the all important factor in making glass collecting economical and by moving banks closer together in one area, and finding a storage depot nearby (ANON 1983c). In the South there are considerable haulage costs (cf to Scotland, and N England) and would not work unless use milk-round system and the potential of advertising on Banks (ROBBINS 1984). The company has made substantial losses on their operations. They feel they were let down by firms who were not willing to advertise and by difficulties encountered dealing with the Local Authorities.

Envirobins invested £200,000 in their glass recycling operation (70 Banks at £1,200 each = £84,000). They met a problem with no support from bottle/jar fillers, but did have some help from GMF. The problem was to hire a lorry at £14 per hour, which could carry between 10 to 20 tonnes. They got a payload of 11 tonnes. The use of a large lorry can create access problems. Sales of 20 tonnes at £10 each bring in £200. Thus a lorry has about (200/14) 14 hours to collect tonnage to breakeven on lorry costs. Need also to take into account time taken in queuing, weighing and unloading vehicle. The costs and revenues are very close.

They looked at the use of a smaller lorry, with a 6 tonne capacity. With this they adopted the 'milk-round' concept of collection and emptied at a central bulking site. This they feel will pay for its self.

Surplus from the scheme is based on the use of scheme for advertisements. They feel that Banks are located in good positions, for advertising boards. The income from the advertisements could be used to finance the scheme and its expansion. The 'reach' of the adverts was investigated by Audience Survey in November 1981 (ANON 1981). Audience Survey found reaction to the Envirobin as very positive, and this was very high (85%) among the valuable ABC1 car park users. The company consulted Manufacturers and found they were principally in favour of the use of advertising.

They would spread out Banks, so advertisements can cover a wide area. They would use adverts income to become self-financing. This dispersion of Banks would increase the problems of transportation and collection.

Although they found certain Manufacturing Companies were in favour of advertising, they found that Advertising Agents did not see it as part of marketing strategy. They then approached Billboard Agents, but found a problem with Banks not being part of bill stickers normal route, and could not incorporate them.

Estimated that if beverage/food manufacturers put one quarter of one percent of their advertising expenditure on supporting Bottle Banks, they could cover the whole of the South East of England and provide an efficient and viable recycling scheme.

The lack of advertising brought problems to the financing of the scheme. They consolidated their operations in Surrey and Kent, supplying glass to Canning Town Glass (CTG). They managed to persuade CTG to set up bulking centres for cullet, with depots at Red Hill and Tonbridge Wells.

However, CTG ran into furnace problems. They lost the use of their green furnace. To overcome this they began to store glass, but did not segregate it. It was stored on an area with no base. Glass became mixed with stones and some became useless.

As CTG ran into problems, they first closed the Red Hill depot without warning. They said that this was a temporary measure and that they would maintain the Tunbridge Wells depot. Then CTG closed the Tunbridge Wells depot. This effectively left Envirobins high and dry cuting it off from its outlet. To maintain the service to the Banks they had to transport glass to the GLC depot at Twickenham. This increased transport costs faced by the Company and they received less for the glass delivered.

Faced with a deteriorating financial position Envirobins have consolidated their operations to Surrey. The Company transferred the Kent sites to CTG to maintain service to consumers.

With the GMF they have managed to persuade Surrey County Council to set up bulking plant at Ellwood. This will be constructed and paid for by the GMF. This will help to put the Surrey operations on a sounder footing.

Surrey County Council want to raise General Rates on the Banks and keep sending writs. The GMF are against establishing a precedent.

The Company has invested £250,000 and they believe that this is lost. The Company is now operating at breakeven, with revenue covering transport costs. They are thinking of setting up a new company Envirobins'84. They will give equipment to the new company and set up new operation and hopefully make a profit.

It would help if they got more support from Surrey County Council.

The GLC estimate waste disposal costs at £14 per tonne, and give a rebate of £7 per tonne for each tonne of glass a Borough recovers. Surrey do not accept that glass recovery will save disposal costs and so will not give a rebate to any one who recovers glass.

A problem is mis-use by Public. They leave boxes by sides of Banks and Company receives the complaints. Others have Bottles by the side of the Banks. Problems of acces to sites by lorries, increases time (costs) that driver and vehicle is at the site.

Envirobins will not expand now, although they feel that the scheme could have gone National. They have taken out Public Liability Insurance. Also have a legal document with Councils on behest of Surrey County Council (Appendix C.12).

Envirobins collect 3000 tonnes per annum.

It was a good system, that was dependant on advertising and could have been developed on a National scale. There was a lack of support from: Government, Councils and Bottle Fillers. If used one quarter of one percent of advertising budget could establish a viable and cost-effective recycling scheme.

C.9 Taylors Glass & Waste Recycling Limited

Taylors operate sites in 12 Boroughs and Districts in Sussex. Within these areas they have 140 sites, each with two modular banks - one for white and one for coloured glass (TAYLOR 1984). These are emptied on a milk-round basis and collections occur about three times each week.

The cullet is then stored in pits and then reloaded into bulk vehicles for delivery to the Glass Manufacturers, at Harlow (ANON 1983f).

They operate with a contract with the Boroughs and Districts. Taylors work scheme for profit, although this has been extremely difficult to achieve. They are now looking at the possibility of exploiting commercial sources.

In Chichester both Envirobins and Taylors have failed to operate recovery schemes. Now a scheme supported by UG and GMF covering 9 sites, collecting 500 tonnes per annum (ANON 1983d).

C.10 Shelogrove Boden Limited

The company was based in the Thames area, operated 62 sites in the Harlow catchment area (ANON 1982). They also operated in the West End of London. In 1982 they ran into problems and began contracting out its operations. The Company withdrew from four schemes North of London.

Its operations in London ran into a number of problems. Access to sites were difficult as lorries were too large and unsuitable. But, smaller vehicles would be uneconomical in transporting glass to Harlow. This put them in a Catch 22 position.

Shelogrove Boden ceased operations in December 1982, and responsibility for their operations was taken over by CTG (ANON 1982a).

C.11 Canning Town Glass Works Limited (CTG)

CTG were involved in glass collection in Kent and Sussex, but ran into trouble with their takeover of Shelogrove Boden (ANON 1983). This lead to recriminations between the company and the Local Authorities where the schemes operated. This is not what the GMF needed, in the promotion of viable schemes (CTG is not a full GMF member).

CTG (ANON 1983) pulled glass collection operations out of Sussex, concentrating resources in Kent. This resulted from Envirobins decision to pull out of Kent, and concentrate their resources on Surrey.

The scheme has now concentrated on East Kent (ANON 1983). Problems resulted from the change in glass production at their Isle of Sheppey Works. This meant that for 6 months there was no green furnace available. Thus there was no outlet for green and mixed cullet, and resulted in high storage costs. It was reported that some glass was stored in a sand quarry, leading to a deterioration in the quality of the cullet (ANON 1983).

Through these problems, the service to Local Authorities suffered. In particular the London Borough of Sutton considered withdrawing, but this move was prevented by the lobbying of the local FOE group. Word from the London Boroughs, suggests that an alternative contractor would be welcome, and discussions are being held with United Glass.

Appendix D

Survey Of Local Authorities

TECHNOLOGICAL ECONOMICS RESEARCH UNIT

TERU

Department of Economics and Department of Management Science
University of Stirling, STIRLING FK9 4LA, Scotland
Telephone: Stirling (0786) 3171 Telex. 777759

Glass Recycling Questionnaire

1. Does your Council operate Bottle Banks? YES/NO*

If NO, why not?

2. Has your Council undertaken a feasibility study into the establishment of Bottle Banks?

YES/NO*

If YES, what were the findings?

3. Has there been any pressure to set up Bottle Banks from:

Government?

Glass Manufacturers?

Local Industry?

Local Groups(which)?

4. Does the Council hold any views on the debate of Returnable Containers versus Non-Returnable Containers?

5. Does your Council have any plans to set up a Bottle Bank scheme? YES/NO*

On what grounds would you establish such a scheme?

6. Is the Council involved in the recycling of any other waste materials? (Please state which)

7. What does the Council think of the role of recycling in Waste Management?

* Delete as applicable.

Thank You For Your Cooperation

Signed.......................................

Name (Block Capitals Please).....................

Official Position................................

Telephone No. ....Ext.................

Date...

TABLE D.1 RESULTS OF THE SURVEY OF NON-OPERATING LOCAL AUTHORITIES

DISTRICT COUNCIL	DOES COUNCIL OPERATE BOTTLE BANK?	IF NO WHY NOT?	FEASBLTY STUDY YES/NO	IF YES, WHAT WERE FINDINGS?	ANY PRESSURE TO SET UP SCHEMES?	COUNCIL's VIEWS RB's vs NRB's	ANY PLANS TO SET UP A SCHEME? ON WHAT GROUNDS?
ANGUS	NO	Nature of equipment & distance to Alloa make it uneconomic.	YES	Full discussions with Glass Recycling Co Delivery costs mean won't break-even.	Local Groups	N/A	NO
ANNANDALE & ESKDALE	NO	Not viable	YES	Not viable	Glass Manuf Local Groups	NO	Viability
BADENOCH & STRATHSPEY	NO		NO		NO	NO	NO
BERWICK-SHIRE	NO	Small rural L.A. - haulage costs Storage?	YES	Uneconomical - good for Public Relations	Local Groups	NO	YES
CAITHNESS	NO	Transportation costs too high	NO	NO	None	NO	NO
CLYDESDALE	NO	Rural area, lacks equipment, limited storage, suggests a loss Maybe extend Modular Banks	YES	See Qn.1 Updates in January from BISSET	Manuf-ongoing publicity Enquiries from Community Cncls	NO	NO-See Qn1
CUMBERNAULD & KILSYTH	YES -		NO		Govt - No Press Glass Mnf - Yes Local Ind - No Local Grps - few individuals	NO As Central Govt	N.A.

TABLE D.1 RESULTS OF THE SURVEY OF NON-OPERATING LOCAL AUTHORITIES (Cont)

DISTRICT COUNCIL	DOES COUNCIL OPERATE BOTTLE BANK?	IF NO WHY NOT?	FEASBLTY STUDY YES/NO	IF YES, WHAT WERE FINDINGS?	ANY PRESSURE TO SET UP SCHEMES?	COUNCIL's VIEWS RB's vs NRB's	ANY PLANS TO SET UP A SCHEME? ON WHAT GROUNDS?
INVERNESS	NO	Scheme would be uneconomic	YES	Uneconomic due to transport to Alloa	Local Groups	NO Chrmn Envtl Health Cttee believes RBs would reduce litter	NO - kept under review Economic viability
KYLE & CARRICK	YES	Started 22/4/83	NO		Initiative Of Council with GMF Support	Not Debated	Reduce glass in waste If economic ally viable
LOCHABER	NO	Not sufficient volume to cover colln costs	NO	Study costs money	NO		NO
MORAY	NO	Not self-financing		See Qn 1	Local Groups Advice from GMF away from Central Belt unlikely to be viable	NO	NO
NAIRN	NO	Advice Of Manufctre - due to distance & small volume, not really interested	YES	Using figure of 0.106/ 1000popn/week would be uneconomical to operate a Glass Recovery Scheme	Local Groups	NO	NO Selfinan cing, in time of LA cuts & pressures to reduce capital spending & rate poundage

TABLE D.1 RESULTS OF THE SURVEY OF NON-OPERATING LOCAL AUTHORITIES (Cont)

DISTRICT COUNCIL	DOES COUNCIL OPERATE BOTTLE BANK?	IF NO WHY NOT?	FEASBLTY STUDY YES/NO	IF YES, WHAT WERE FINDINGS?	ANY PRESSURE TO SET UP SCHEMES?	COUNCIL's VIEWS RB's vs NRB's	ANY PLANS TO SET UP A SCHEME? ON WHAT GROUNDS?
ROSS & CROMARTY	NO	Not a financially viable exercise	YES?	Not sufficient popn centres to justify establishment of Bottle Banks Not financial	Local Groups	NO	NO If posible to obtain a financial return If Govt incentives for LAs far from glass markets
KYLE & LOCHALSH	NO		NO		NO	Use of RBs in scattered rural area with influx of Tourists in Summer is impractical	NO
STEWARTRY	YES	Just about to introduce Banks	N.A.		N.A.	NO	N.A.
SUTHERLAND	NO	Neither Popn or geography of the District, lends itself to such a scheme	NO		NO	Shouldn't think so	NO
WIGTON	NO	Due to high transport costs	YES	Transport costs - most southerly area in Scotland	Govt - No Regular info sheets from Kelli[illegible]bank Local Groups	Not specifically discussed	Future review Neighbourhood setup schemes - possible to share transport [illegible]ts

TABLE D.1 RESULTS OF THE SURVEY OF NON-OPERATING LOCAL AUTHORITIES

DISTRICT COUNCIL	IS THE COUNCIL INVOLVED IN THE RECYCLING OF ANY OTHER MATERIAL?	WHAT DOES THE COUNCIL THINK OF THE ROLE OF RECYCLING IN WASTE MANAGEMENT?
ANGUS	Wastepaper	Strong feeling for conservation -but- priorities established in choice of the method of disposal & types of equipment
ANNANDALE & ESKDALE	Yes	Interested in the viability of any recycling proposal in these times of economic stringency
BADENOCH & STRATHSPEY	No	Not discussed at length
BERWICKSHIRE	No	Looking for economically viable schemes
CAITHNESS	No	Costs of transport south, are against it
CLYDESDALE	No	Requires cooperation from the public and return has to be economic in the long run Research in WDF?
CUMBERNLD & KILSYTH	No	No problem, if self-financing to the ratepayer
INVERNESS	Wastepaper	Generally in favour of recycling - wastepaper continued despite loss in monetary terms
KYLE & CARRICK	Paper & Cardbrd Fe & Non-Fe Mtls	Most important, should be increased where possible
LOCHABER	No	Yes, if financially viable
MORAY	No	Waste paper collection ended as not financially viable
NAIRN	Not at present	In principal worthwhile. Due to high labour costs, & low return for waste materials - uneconomic/High haulage cost Uneconomic to consider such schemes
ROSS & CROMARTY	No	In favour in principle, must be financially self-supporting
SKYE & LOCHALSH	Scrap Vehicles	Small volume of refuse collected, & distance from Industrial Centres makes most forms of recycling uneconomic
STEWARTRY	No	Desirable, provided it is economic
SUTHERLAND	No	Not known
WIGTON	Not at present Cardbrd stopped due to depressed market	Under review - 'Operationally viable' - not loss making concern making concern

TECHNOLOGICAL ECONOMICS RESEARCH UNIT

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Glass Recycling by Local Authorities - Case Study.

Part 1 Glass Recycling - Overview.

Q.1.a. Name of Local Authority .... ______

b. Approximate Area .... ______

c. Approximate Population .... ______

d. Number of Domestic Premises .... ______

e. Number of Commercial Premises .... ______

Q.2. How long has the Local Authority been involved in glass recycling (Bottle Banks)?

.... ______ Years ______ Months.

Q.3. Why did the Local Authority establish a Bottle Bank collection scheme?

Q.4.a. Did the Council undertake an initial feasibility study? ...... YES 1

NO 2

PLEASE CIRCLE WHERE APPROPRIATE

b. If YES to 4.a, what were the findings?

c. If NO to 4.a, why not?

Q.5.a. Was there any guidance from Central Government in setting up the Bottle Bank Scheme? .... YES 1
NO 2

b. Was there any advice from the Glass Manufacturers Federation?. YES 1
NO 2

c. What role did industry play?

d. Did local groups have any influence? .... YES 1
NO 2

Which Groups?

Q.6.a. Who runs the scheme? .... Council ________
(Please enter number of sites) Industry ________
Local Groups ____

b. If Council, which Department? .... Cleansing ________
Environmental Health __
Other (State) ________

c. If industry, which?

Q.7 What costs/overheads do you allocate to the scheme; or do you separately account for the costs?

Q.8.a. What criteria do you use to judge the success of the scheme?

b. How well does the scheme match up to these criteria?

c, Do you view the scheme as a success?

(Continued)

Q.9.a. Do you have a contract with Alloa to supply cullet? ....YES 1
NO 2

IF YES:
b. Length of contract? .... _______ Years.

c. Is there a minimum tonnage?..................... YES___ Tonnes_____
NO____

d. Is there a maximum tonnage?..................... YES___ Tonnes_____
NO____

e. Are there conditions on quality?............... .... YES 1
NO 2

f. Is there a guaranteed price? .... YES 1
NO 2

Q.10. Does the Council view the scheme as a Public Relations exercise?

Q.11.a. Does the Council hold a view on the debate of Returnable Containers versus Bottle Banks?

b. Do you yourself hold a view on this debate?

Q.12.a. Does the Council have any involvement in any other recycling schemes? (Please state which.)

Q.13.a. What is the Council's view on the role of recycling in waste management?

b. What is your own view on the role of recycling in waste management?

Q.14. Do profits from the scheme go into general funds or are they used for specific purposes?

Q.15. Any other points you wish to raise?

** Thank you **

Signed.......................................
Name (Block Capitals Please).....................
Official position...................................
Telephone Number..............Extension...........
Date...

Appendix D Local Authority Survey

D.4 The Overview

The results are based on replies from 23 District Councils.

D.4.1 Question 1

TABLE 7D.1 CHARACTERISTICS OF DISTRICT COUNCILS

REGION	DISTRICT COUNCIL	CODE	POPULATION	AREA (Ha.)	DENSITY (Popn/ Area)	NUMBER OF DOMESTIC PREMISES	COMMERCIAL PREMISES
GRAMPIAN:	Aberdeen	1	250,000	18,478	13.52	84,542	6,481
	Banff	2	82,000	155,397	0.53	32,000	3,500
	Gordon	17	66,075	221,444	0.29	26,120	1,900
	Kincardine	21	43,000	254,754	0.17	17,600	1,436
TAYSIDE:	Dundee	9	183,339	24,825	7.38	74,656	2,779
	Perth	28	118,700	523,505	0.23	50,303	11,186
FIFE:	Dunfermline	10	126,971	30,155		47,973	2,019
	N.E. Fife	27	65,000	67,313		27,384	1,588
DUMFRIES:	Nithsdale	26	56,250	143,313		22,000	500
LOTHIAN:	Edinburgh	13	446,400	26,524	16.83		
	E Lothian	12	80,000	71,332	1.12	33,000	5,000
	W Lothian	34	140,000	41,669		49,443	2,855
BORDERS:	Ettrick	14	32,000	134,626	0.24	14,296	2,402
	Roxburgh	30	60,000	155,337	0.38	15,000	80
CENTRAL:	Falkirk	15	144,361	30,059	4.80	50,443	1,998
	Stirling	31	80,000	207,117		28,000	1,600
STRATH-	Cumnock	6	45,500	88,024	0.52	16,230	748
CLYDE:	Glasgow	16	767,456	20,234	37.93	297,000	39,000
	Hamilton	18	108,000	13,203	8.18	36,000	
	Inverclyde	19	100,900	16,199	6.23	37,000	950
	E Kilbride	11	80,000	71,332	2.99	33,000	5,000
	Monklands	24	110,000	15,533	7.08	36,909	935
	Renfrew	29	208,000	30,885	6.73	70,000	4,000
	Strathkelvin	32	88,500	16,698		29,000	900
N			24	24		23	22
TOTAL			3,482,452	2,377,956		1,127,899	96,857
MEAN			145,102	99,018		49,039	4,402

D.4.2 Question 3

Reasons Councils gave for establishing Bottle Banks are summarised under three main headings:

Local Context
Public/Council Opinion
National Context

Within each group there are several distinct reasons.

LOCAL CONTEXT

Benefit with less refuse to be dumped (Councils: 2,11,12,14,16,17,18,26,32)	9
Removes potentially dangerous glass from general collection sacks (Plastics) - (6,10,12,18,34)	5
Less nuisance from broken glass in litter terms (2,10,32)	3
Obtain some income with minimal disposal costs (12,14,16)	3
Indications were that it would be economically viable (28)	1
Nearness to Alloa (31)	1

PUBLIC/COUNCIL/GMF Opinion/Pressure

Council Envtl Cmttee Decisions/Officers & Councillors/ Community Councillors (19,24,30,34)	4
GMF Suggestion (9,15,32)	3
Provide service requested by citizens (1)	1
Study of pilot schemes of similar councils (34)	1
Information from National Press (34)	1

NATIONAL CONTEXT

Give practical support to recycling (where economically viable) (1,11,12,29,34)	5
Add support to National glass collection scheme (2,6,14,17)	4
Help energy conservation (Industry) (2,11,14,31)	4
Ecologically sensible though not necessarily economically viable (21)	1
Desire to salvage rather than throw away (10)	1
Reduce imports of raw materials (17)	1
Material recovery (34)	1
Conserve National resources (26)	1

NO COMMENT (27) 1

D.4.3 Question 4

Feasibility study?

Eleven of the Councils had carried out a feasibility study. The aim of the studies was to see what the likely public response would be and whether such a scheme would be economic.

Banff, E Lothian, Roxburgh, Strathkelvin, and Glasgow noted that there would be sufficient response. In particular the Banff study saw that it was possible to collect sufficient glass from the four main towns in the District economically.

Falkirk, Ettrick, Monklands, W Lothian and Gordon concentrated more on the likely costs of a scheme. In Gordon, the study was the monitoring of the usage of the three sites over the period of one year. They noted that the Bottle Bank haulage would account for 50% of Council's income from the project. The response on pilot bank was sufficient to justify maintaining and extending the scheme in Perth.

Twelve Councils (1,6,9,10,11,18,19,21,26,27,29,31) did not undertake studies:

Cumnock, and Dundee see the scheme itself as the feasibility study, and as the only way of actually establishing the level of public response.

N E Fife, Renfrew, Nithsdale set up the scheme on advice of GMF.

Aberdeen saw success elsewhere and decided to set up Banks.

Dunfermline, E Kilbride and Hamilton thought it was unnecessary.

Stirling made their decision on their proximity to Alloa.

D.4.4 Question 5

Question 5 set out to establish where guidance on setting up a recycling scheme may have come from. None of the Councils received any guidance from National Government. Twenty of the respondents received information from the GMF, on other schemes and reasons for establishment. Apart from the GMF and UGC Alloa, industrial support was limited. In Gordon, a local soft drinks manufacturer supplies cullet to the scheme. In Cumnock, the Glass Recycling Company acts as the contractor supplying and emptying the skip when advised by the Cleansing Department. With Renfrew and Strathkelvin they have one of their banks sponsored by industry.

Local Groups have no role in twelve of the districts (1,2,6,11,15,18,19,26,27,29,31,34). In the others it was mainly the Community Councils which were influential (10,14,16,28,30,32). Other groups involved were: Conservationist (9), F.O.E. (10,28), Women's Rural Institute (12), Airdrie Civic Society (25).

D.4.5 Question 6

Who runs the scheme?

Councils are directly involved in the running and operation of 22 schemes, ranging in size from 2 to 24 sites. Industry is involved in two separate schemes at Cumnock and Kilmarnock, and in conjunction with Council run schemes at Aberdeen (9 sites), E Lothian (4), Falkirk (8), Gordon (1), Monklands, Stirling (3), Glasgow (31), Edinburgh (13) and Perth (4). Local groups are involved in two schemes at Dunfermline (2 sites) and at Glasgow (3 sites).

Within Councils, control is either by the Department of Cleansing (9), the Department of Environmental Health (6), or a Department that combines both functions (8).

Industry involved are:

Glass Recycling Company (Cumnock, Kilmarnock)
UGC Alloa (Falkirk, Glasgow, Edinburgh)
GMF (E Lothian).

D.4.6 Question 7

Question 7 looks at what costs/overheads are allocated to the scheme. Separate costing is claimed by 6 of the Councils (19,21,24,26,31,32). Seven Councils allocate no costs and do not separately account for the scheme (6,10,12,16,18,29,30).

Of these:

Cumnock (6) stated that any works or costs such as keeping the surrounding site area tidy are absorbed within existing budgets.

Roxburgh (30) said that an initial costing was made for the transportation of glass from the Council Depot to the Manufacturers Depot, that showed that there would be a substantial surplus (See Qn 8).

Glasgow (16) does not separate costs/overheads from the transport budget as a definite accounting procedure. When requested they can be allocated to prove the Councils profit/loss margin from total cost/revenue accounts.

The other Councils allocate certain costs to the scheme:

Dundee (9) allocates costs of: refurbishing existing skips, painting in Bottle Bank colours, supplying decals, collecting skips, transporting to central site, emptying into 30 cubic yard skip, and transport to Alloa.

E Kilbride (11) allocates costs of: skip uplift and transport, litter bins, repairs, maintenance and painting.

Ettrick (14) estimates income in relation to transport costs etc., despite any profit for a specific year. They also maintain a specific Bottle Bank sub-account in the Refuse Collection Budget.

Falkirk (15) makes provision in the revenue budget to cover skip maintenance, which has been minimal in the last four years.

Gordon (17) allocates costs for: Bottle Banks, Storage Bays, Delivery to Alloa, and the emptying and return of skips to their site.

Kincardine (21) separately accounts for direct transport and labour charges.

N E Fife (27) has allocated .9,010 so far.

W Lothian (34) allocates installation costs, maintenance, collection and delivery costs.

Perth (28) allocates £1,000 per annum against the scheme.

The Local Authorities have not adopted a uniform accounting scheme for the operation of their Bottle Bank schemes. This makes the comparison of similar schemes very difficult, and the judgement of the success/failure of a scheme open to doubt. What is needed is a uniform and sensible accounting system to be adopted by all authorities.

The key costs identified are:

Costs of Bottle Banks (Capital)
Storage Bays (Capital)

Maintenance - refurbishment
painting
decals

Site Maintenance - Litter Bins

Skip uplift

Storage
Transport to Alloa

It is on the basis of these costs that a useful comparison and assessment of existing schemes can be made, and the viability of future schemes be judged.

D.4.7 Question 8

Criteria success judged on, how the schemes match these criteria, and how the Councils actually view their success.

The criteria can be split into three categories:

1. Weight/Public Response
2. Financial
3. Other

WEIGHT/PUBLIC RESPONSE

Amount of cullet collected each month (1,2)
- relation to population of catchment area (6,12)
- ° of public response (weight of glass) (12,16,17,18)
- rate of filling (19,27,31,32,34)
- improvement in tonnage (14,29)
- weight on each site, total tonnage (28)

FINANCIAL

Does it breakeven? (9)
- costs L.A. nothing to run, makes L.A. money (10,14,15,27,29)
- Profit (16,19,26)
- can costs be justified against public response (17)
- minimal financial loss (16)

OTHER

Less glass on tips - less punctures (15,16,30)
Energy conservation (10)
Performance relative to other L.A.s (24)

Part two looked at how well the Council felt that the schemes matched up to the criteria for judging success. Views varied:

Very Well So Far	12, 30
Fairly Well	21
Satisfactory/Reasonable/	1,2,10,11,15,17,26,
Adequate/Up To Expectations/	28,31,34
Fair	19,29
Not As Successful As Expected/	
Disappointing, But Steady	6,32
Not Very Well	24
Scheme Not Fully Developed Yet	27
Only 1 Bank Satisfies Target	18
Fifth Site Disappointing	17
Well, But Investment Necessary	
To Fund Additional Units	14

Most Councils feel that there schemes are satisfying the criteria they laid down for success. In response to the question do they see their scheme as a success, 19 Councils did. Five qualified this statement: Gordon (17) saw it as a success on non-financial grounds. Monklands (24), and Strathkelvin (32) saw the scheme as only marginally successful. W Lothian (34) have two sites under review. Glasgow (16) saw the scheme as financially satisfactory.

Cumnock (6) and Stirling (31) viewed the scheme as being not-successful.

Hamilton (18) saw it as not-particularly successful and Dundee (9) had no response.

D.4.8 Question 9 - Contract

15 Councils said they had no contract but 7 said they had (14,16,17,21,27,31,34), although W Lothian (34) said that it was not a formal one.

On length of contract one said that there was no limit (16), and another that it was continuous (31). The Councils had no agreements on tonnage requirements.

On Quality, 8 Councils (1,9,10,11,14,15,24,27,29) said there were formal agreements. However, five (16,21,30,31,34) said there were no conditions.

Another area of doubt is over the 'guaranteed price' offerred by the recycling centre. Six Councils (10,11,14,15,24,31) said that there was a guaranteed price. Glasgow (16) said that it was only recently that it was guaranteed. Six Councils (1,9,27,29,30,34) said it was not guaranteed. Nine did not comment.

D.4.9 Question 10 P.R. Exercise

Thirteen of the Councils saw it as a publicity exercise, but four qualified this statement:

Falkirk (15) regarded the scheme to a certain extent as a publicity exercise, but more importantly it is regarded as a viable recycling scheme.

Renfrew (29) saw it as part of the overall programme of conservation and recycling.

Glasgow (16) feel that the Bottle Bank shows the public that the Cleansing Department is making an effort on their behalf to not only make the existing refuse collection scheme even more thorough, but also to make that service financially viable.

Five (1,15,21,26,31) saw it as a partial public relations exercise.

Four (2,11,24,34) did not see it as a public relations exercise. Banff saw it as a practical effort (See Qn 3).

D.4.10 Question 11 Returnables

Most of the Councils had not specifically debated this issue.

Some of the responses were:

Aberdeen are in favour of returnable containers.

E Lothian feel that returnables are often abused, and this can cause a risk to health.

Roxburgh said that concern was expressed on the amount of good glass bottles not being accepted as returnable.

Several officers expressed their own opinion:

Banff - Until such time as returnables can be successfully re-introduced, Bottle Banks have a necessary role to play.

E Lothian - Single use containers have the advantage of not being exposed to possible abuse by the public if returned for re-filling. However, in industries where the product is low cots, returnable containers are essential to make operations viable. With high cost products the proportional cost of the bottle is low, thus collecting, cleaning and re-filling is not financially viable.

Falkirk - There is a risk factor in ensuring hygiene with returnable containers.

Glasgow - Any method which will reduce the glass content from refuse is of major benefit for both the collection and disposal of refuse.

Gordon - Mis-usage which can occur with containers, and difficulties which arise in having 100% efficient washing and sterilising of the containers makes non-returnable containers a safer product from the health viewpoint.

Inverclyde - Returnable containers depends on public and business co-operation and reliability. There are advantages and disadvantages to both systems; with the present system being reasonably successful.

Monklands - Market economics will exert continuing influence, e.g. transport and energy costs.

Perth - No, because market forces will determine issue irrespective of any ideological arguments.

Roxburgh - Concern on fact glass bottles not accepted as returnables.

Stirling - Use of returnables should be extended.

Strathkelvin - System of returnable containers would certainly reduce the volume of glass which is presently discarded indiscriminately despite advent of Bottle Bank.

W Lothian - Would like to see more returned to shopkeepers, and more realistic deposits given for their return. Legislation is not practicable.

The main area of concern expressed by Council officers is one of hygiene through the possible mis-use of containers. The WMAC Report (1981) concluded that current practices are such that the hygiene problems associated with present systems are extremely small.

Another problem expressed was the 'ease' or lack of it, in returning returnables to retailers.

7.D.11 Question 12 - Recycling Other Materials

Four other materials were recycled:

Wastepaper (1,2,9,10,12,14,15,17,27,29,30,31,34)	13
Cardboard (9,10,12,15,16,17,18,29,34)	9
Oil (Waste)(10)	1
Metals (10,16,24)	3
Not Involved (3,11,19,21,26,28,32)	7

The main waste recovered is that of paper, which is usually combined with a system for recovering cardboard. Dundee collect about 2000 tonnes of paper and cardboard per annum, and Ettrick recovers 800 tonnes per annum.

Inverclyde and Nithsdale have suspended their waste paper and cardboard collection operations. Inverclyde stopped their recovery due to local financial loss incurred, and also the scheme required capital expenditure on a new baing plant which cannot be justified. Nithsdale have suspended their paper salvage scheme a year ago because of costs. Equipment is still in situ, and could be revived if the local situation improves.

Scrap metal is recovered by a minority of councils. In Inverclyde at present, no local scrap contractor will uplift mixed scrap metal, that is separated from the general refuse intake. Ettrick are encouraging local organisations to collect aluminium for sale to ALCOA (Edinburgh).

D.4.12 Question 13 - Attitudes To Recycling

The general view of the Councils on the role of recycling in waste management, was that it should be pursued where it is cost-effective. Specific comments made by Councils include:

Aberdeen - are committed to a recycling policy.

Banff - would support cost-effective schemes, or schemes that will breakeven.

Cumnock - recycling has to be judged on a cost-effective basis; if it does not pay, do not do it.

Dundee - If it provides additional employment at no extra cost, would favour recycling i.e. Breakeven.

Dunfermline - Important

E Kilbride - Desirable where practicable.

E Lothian - If refuse can be re-used to some benefit then it should be encouraged.

Ettrick - The primary objective is the diversion of waste from landfill sites where space is at a premium, with the secondary objective being income.

Falkirk - will give consideration to any viable recycling scheme.

Gordon - Recycling is unlikely to produce good financial return on the necessary capital and revenue expenditure. However, the Council accepts that the majority of rate payers wish the Council to be involved in the saving of natural resources and therefore do not object to the expenditure.

Glasgow - Due to the cost involved in separating certain materials they do not recycle as much as would like.

Hamilton - Important.

Inverclyde - Recycling is restricted due to the financial situation of cutbacks in Local Government (i.e. nothing at present, that cannot be run at s local/internal economic profit).

Monklands - Enthusiastic if economic and job providing.

Nithsdale - Very commendable given necessary resources and a guaranteed market.

Perth & Kinross - Council has no fixed policy on the subject but would readily partake in a recycling programme if it were economically viable.

Roxburgh - Majority express satisfaction that they are fulfilling a contribution to country's needs.

Stirling - Council intend to continue recycling wastepaper and glass, but it is most unlikely that any other commodity will be considered.

W Lothian - Positive subject to reasonable economic return.

Kincardine & Strathkelvin have not considered the matter.

Several Council Officers gave their own views:

Aberdeen - Recycling will continue to grow and play a very important part in future waste management.

Dunfermline - Important, but has to be economically viable in these difficult financial times.

E Lothian - At present, various recycling schemes are of doubtful value economically, but can vary as position of raw materials changes. With the present average refuse contents with high calorific value and reduction in ash, the obvious use is heat/energy, but current UK incinerators rules this out economically. Used successfully in Denmark.

Falkirk - As Council, provided viability meant showing a profit, not merely breakeven, or covering costs.

Glasgow - As long as recycling remains a profit making venture then it can only be a step forward in providing a better cleansing service to the public.

Gordon - Recycling is a means of saving natural resources, and of reducing problems in:

a. the refuse pulverisation plant;
b. the reclamation site.

Hamilton - The Department endeavours to recycle as much as possible, but any new scheme must now be able to clear itself.

Inverclyde - Important, particularly from Environmental considerations at National/International level - would benefit from economic balancing at a macro/National level with Central Government planning and co-ordination (policy), and financing involvement. In present economic conditions it is very difficult, or prohibitively non-viable in certain areas on a local basis.

Kincardine - Provided it is not detrimental to the Local Authority, any recycling scheme, can only be beneficial.

Monklands - Essential, but not enough research into separation and collection at source.

Perth & Kinross - Recycling in waste management should be encouraged but Local Authorities cannot ignore the economics of the activity. To date there has been insufficient realistic support from Central Government on recycling of wastes.

Renfrew - Should be pursued where return on capital invested is acceptable.

Stirling - Recycling is very important but it is seldom cost-effective especially in an area with sparse population.

Strathkelvin - Guidance and assistance, including financial should be organised at a national level.

W Lothian - Positive, paper salvaged since 1939-40.

7.D.13 Question 14 Allocation Of Profits.

Sixteen Councils allocate any profits to General Funds (2,9,10,14,15,16,18,21,24,26,27,28,29,30,31,32,34). Some Councils have qualified this statement:

Dunfermline allocate funds from L.A. Banks to the General Funds, and from the Modular Banks to Community Councils.

At present, Ettrick allocates profits to their general funds, but the future intention is to use profits to encourage local interest/participation either through donations of cash/kind to deserving elements, or through competitions.

Within their General Funds N E Fife allocate against collection costs.

Roxburgh allocate to the General Funds as a source of stabilising the rates.

Perth, allocate to General Cleansing Service Fund.

Some Councils allocate any returns for specific purposes:
Aberdeen credits all profits to the Bottle Bank account for use in expanding the scheme.

E Kilbride set any profits back against Bottle Bank expenditure.

E Lothian at present uses any profits to buy additional Modular Banks.

Two Councils claim that there are no returns (Cumnock), and that there are no profits from recycling (Gordon).

W Lothian gives a return to such groups as Scouts, Boys Brigade, and Schools for special collections of waste paper and/or glass.

7.D.14 Question 15 Any Other Points

Dunfermline is profiting from the scheme in all ways, not just financially.

Ettrick have had a good response for oil, yet only get some 10% of available glass.

Gordon feels that they should receive financial assistance from Central Government; as the saving of natural resources has an effect on the cost of imports to the UK economy.

Roxburgh feel that other aspects of recycling should be considered other than financial gain on the Balance Sheet, i.e. Recycling of waste paper reduces the intake to refuse disposal site by 40 cubic metres weekly at a cost of running the site of 8 per cubic metre. As this material would have to be uplifted anyway, if not recycled, it would mean the same amount of staff and vehicles being employed with no financial return to the Council. A similar situation arises with glass, where valuable space would be taken up at the disposal site. Approximately 18 cubic metres of broken glass is dispatched fortnightly. If deposited on the tip most would remain unbroken amounting to 4 or 5 times this capacity. Also there would be savings to tyres which cost up to £100 each.

Strathkelvin - If there is a need for recycling of waste materials, some form of national control is necessary.

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Glass Recycling by Local Authorities - Case Study.

Part 2 Bottle Bank - Cost Statement.

Q.1.a. Who runs the Bottle Bank scheme? .... Council ______
Industry ______
Local Group ______

b. Number of sites operated? .... Council ______
Industry ______
Local Group ______

c. Type of skip used? .... Bottle Banks ______
(Please enter number of skips) Modular Bottle Bins ______
Other (Specify) ______

d. Type of location? .... Supermarkets ______
(Please give number of sites) Car Parks ______
Civic Amenity Sites ______
Others(Please state) ______

e. Other sources of cullet (Firms)?

f. If 1.e is positive, is there a return to the Council?

Q.2.a. Cost of a new Bottle Bank skip? .... £ ______

b. Cost of Modular Bottle Bin? .... £ ______

c. Number of skips purchased outright?............... ______ Banks
______ Bins

d. Number of Bottle Banks hired? .. ______. Cost of hiring? . £ ___/Bank/Week.

e. Number of Modular Bins hired? .. ______. Cost of hiring? £ ___/Bin/Week.

f. Number of skips sponsored? .... ______ Banks.
______ Bins.

g. Extent costs defrayed by sponsorship?

Q.4.a. Cost of any additional litter bins on sites?......... £____/bin.

b. Number of extra bins?.............................. ________

Q.5.a. Cost of storage bays for cullet?.................... £________

b. Number of bays?.................................... ________

c. Are the bays enclosed or open?...................... ________

d. Do they use existing Council land?.................. YES 1

NO 2

PLEASE CIRCLE WHERE APPROPRIATE

Q.6. Cost of:-

..... Skip Lifters £________

Mechanical Shovels £________

Other(Please Specify) £________

Q.7.a. Are Administrative costs separately accounted?....... YES 1

NO 2

b. Administrative costs? .... £____/Year.

Q.8.a. Do you advertise the Bottle Bank scheme? .... YES 1

NO 2

IF YES:-

b. What are your advertising costs? ..... Posters £________/Year.

Newspapers £______/Year.

Other(Specify) £___/Year.

c. Do you have advertising on the bottle banks? .... YES 1

NO 2

d. If YES to 8.c, who are the advertisers?

Q.9.a. Are insurance costs separately accounted?.......... YES 1

NO 2

b. Annual insurance costs?.......................... £______

Q.10.a. Cost of emptying Bottle Bank per load? .... £ ______

b. Is the emptying done by Council or Contract? ..... Council 1
Contract 2

Q.11.a. Cost of tidying site per load? .... £ ______

b. Is it separately accounted for? .... YES 1
NO 2

c. Is it incorporated in general street cleansing? .. YES 1
NO 2

Q.12.a. Cost of Bottle Bank maintenance? .... £ ______/skip/yr.

b. Do you receive a grant for maintenance? .... £ ______/skip/yr.

Q.13.a. Annual tonnage of cullet collected? .... ______ tonnes.
(Calendar year? ..... ______)

b. Amount of clear (flint) glass coollected? .... ______ tonnes.

c. Amount of coloured class collected? .... Brown ______ tonnes.
Green ______ tonnes.

Q.14.a. Average content of skips? .... Bottle Banks ______ tonnes/load.
Modular Bins ______ tonnes/load.

Q.15.a. Capacity of skips? .... Bottle Banks ______ Tonnes.
Modular Bins ______ Tonnes.

Q.16. Average rate of filling ? .... ______ tonnes/week.

Q.17. Distance of storage site from reprocessing plant? ______ miles.

Q.18.a. Cost of bulk transport to reprocessing plant? ... £______/tonne.

b. Is this by Council or Contract vehicles? .... Council 1 / contract 2

c. Number of trips per month? .... ______

Q.19.a. Cost of loading for bulk transport? .... £______/tonne.

b. Is it separately accounted for? .... YES 1 / No 2

Q.20.a. What price is received for cullet? ...... Clear £______/tonne.
Green £______/tonne.
Brown £______/tonne.
Mixed £______/tonne.

Q.21.a. Is there any remittance from waste disposal accounts? YES 1 / NO 2

b. Is it accredited to Bottle Bank accounts? .... YES 1 / NO 2

c. Value of remittance? .... £______/tonne.

Q.22.a. Average waste disposal costs? .... Landfill £______/tonne.
Incineration £___/tonne.
Other(State) £___/tonne.

b. Average waste collection costs? .... £______/tonne.

Q.23.a. Are there any links with local charities? .... YES 1 / NO 2

b, If YES, which charity?

c. Benefits of charity links?

d. Are there likely to be charity links in the future? YES 1 / NO 2

e. If YES, which charity?

Q.24. What do you see as the benefits of glass recycling?

Q.25. Are there any problems in operating bottle banks in your area?

Q.26. What do you see as possible future developments?

Q.27. Any other factors you feel should be included?

** Thank you **

Signed ....
Name (Block Capitals Please)................
Official Position ....
Telephone Number .... Ext........
Date ....

TABLE D6.1 Filling Rates

CNCL CODE	No OF BANKS SURVEY	No OF BANKS GMF	NO OF MODULARS SURVEY	NO OF MODULARS GMF	TONNAGE SURVEY YEAR TOTAL	COLLECTED GMF Qu(April-June '83) BANKS	COLLECTED GMF Qu(April-June '83) OTHER SOURCES	PROJECTED YEAR TOTAL BANKS	PROJECTED YEAR TOTAL ALL	SURVEY AVERAGE RATE FOR WHOLE SCHEME	CALCULATED ON SURVEY PER SKIP	GMF CALCULATED ON PER SCHEME	GMF CALCULATED ON PER SITE	GMF CALCULATED ON PER SKIP
Grampian:														
1	49-9	11	-	-	361	67.75	77.97	270.60	582.48	1.56/week	(6.94/scheme)			
2	4	4	-	-	110	24.50	-	98.00		2.12/week	0.53t/wk/skip			0.47
17	6	3	-	-	100	33.69	2.89	134.76	146.32	0.5t/wk/skip				0.46
21	-	-	5	5	139	35.12	-	140.48		n.k. (2.7/wk)	0.54t/wk/skip			
Strathclyde:														
3	-	2	-	-	-	36.33	-	145.32	-	-				1.39
5	-	1	-	-	-	3.19	-	12.76	-	-				0.24
-	-	-	-	11	-	n.a.	-	-	-	-				
6	1	1	-	-	17	3.16	-	12.64	-	0.30/week	0.33t/wk/skip			0.24
7	-	2	-	-	-	n.a.	-	-	-	-				
8	-	3	-	-	-	57.98	-	231.92	-	-				1.48
-	-	1	-	-	-	20.09	-	80.36	-	-				1.54
-	-	2	-	-	-	10.23	-	40.92	-	-				0.39
16	11	11	31	32	531	145.22	-	580.88	-	11.07/week	0.24t/wk/skip			0.26
18	3	3	-	-	-	47.07	-	188.28	-	(1.0t/wk/0.2t/wk/0.1t/wk)				1.21
19	6	6	-	-	105	26.16	-	104.64	-	2.0t/wk	0.33t/wk/skip			0.34
11	6	5	-	-	131.18	35.10	-	140.40	-	0.5t/wk/skip	0.42t/wk/skip			0.54
20	-	1	-	-	-	14.99	-	59.96	-	-				1.15
-	-	4	-	-	-	n.a.	-	-	-	-				
24	2	2	5	5	19.86	15.93	-	63.72	-	0.4t/wk		1.2t/wk		0.17
25	-	2	-	-	-	6.03	-	24.12	-	-		0.46t/wk		0.23
29	7	7	-	-	210.6	21.46	-	85.84	-	0.86t/wk	(210/52/7)= 0.57t/wk/skip	1.65t/wk		0.23
32	2	2	2	2	92	31.84	-	127.36		(92/52/2=0.88t/wk	(92/52/4) = 0.44t/wk/site	2.40t/wk		0.60
Fife:														
10	3	3	28(14)	14	106.7	68.38	-	273.52	-	2.00t/wk				0.31
27	4	4	8	12	191.09	58.32	-	233.28	-	3.50t/wk	0.29t/wk/skip	4.48t/wk		
22	-	6	-	9	-	93.71	-	374.84	-	-		7.20t/wk	0.4/wk	

TABLE D6.1 Filling Rates

CNCL CODE	No OF BANKS SURVEY	No OF BANKS GMF	NO OF MODULARS SURVEY	NO OF MODULARS GMF	TONNAGE SURVEY YEAR TOTAL	COLLECTED GMF Qu(April-June '83) BANKS	COLLECTED GMF Qu(April-June '83) OTHER SOURCES	PROJECTED YEAR TOTAL BANKS	PROJECTED YEAR TOTAL ALL	SURVEY AVERAGE RATE FOR WHOLE SCHEME	CALCULATED ON SURVEY PER SKIP	GMF CALCULATED ON PER SCHEME	GMF CALCULATED ON PER SITE	GMF CALCULATED ON PER SKIP
Dumfries & Galloway:														
26	2	1	-	-	150.62	40.79	-	163.16	-	2.9t/wk	1.45t/wk/skip	3.13t/wk		3.13
Tayside:														
9	6	6	-	-	350	51.26	27.73	205.04	315.96	0.71t/wk/skip	(350/52/6=1.12t)	6.07t/wk		1.01
28	4	4	4(8)	4	185	50.60	-	202.4	-	(185/52/4 - 0.8t/wk/bank)	0.44t/site 0.29t/skip	3.89t/wk	0.48/site	
Lothian:														
13	25	20	23	-	1300	251.92	118.11	1007.7	1480.1	Varies (Banks 1t/wk)	All 0.5t/wk			
12	4	4	13	9	-	32.12	-	124.5	-	-		2.47t/wk	0.19t/wk	
23	-	1	-	2	-	18.77	-	75.08	-			1.44t/wk	0.48t/wk	
34	6	6	-	-	213	28.13	73.23	112.52	405.84	4 for scheme 0.68t/skip		7.80t/wk	1.30t/wk	
Borders:														
14	4	4	-	-	98	22.84	-	91.36	-	0.8t/week (1.88t/schme)	0.47t/wk	1.76t/wk	0.43t/wk	
30	1	1	2(4)	2	220	28.91	-	115.64	-	1.5t/week (4.20t/schem)	0.84t/skip 1.40t/site	2.22t/wk	0.74t/wk	
33	-	1	-	3	-	26.02	-	104.08	-	-		2.00t/wk	0.50t/wk	
Central:														
4	-	1	-	8	-	19.74	-	78.96	-	-		1.52t/wk	0.16t/wk	
15	6	6	8(16)	8	145	46.11	144.25	184.44	190.36	(0.2t/skip)	0.19t/wk	3.66t/wk	0.26t/wk	0.01t/wk
31	5	6	3(6)	3	140	48.83	-	195.32	-	(3/wk) (2.6t/sscheme)	0.34t/site 0.23t/skip	3.76t/wk	0.46t/wk	0.34t/wk

TABLE D6.2 Survey Results

CNCL CODE	No OF BANKS: CNCL	IND	OTHER	TYPE OF SKIPS: BANKS	MODULAR	OTHER	LOCATION: SPMKT	CARP	CAS	OTHER	OTHER SOURCES	RETURN	COST OF SKIPS: BANK	MODULAR	OTHER	NO PURCHASED: BANK	MODULAR	OTHER	HIRING: BANK	MDULR	SPNSHP
Grampian:																					
1	49-9	-	-	-	-	Paladin	4	1	1	Clnsng Depots	Licensed Premises	All cullet is Recycled	Adptd	-	-	-	-	-	-	-	-
2	4	-	-	4	-	-	1	3	-	-	-	-	1750	-	-	2 (2 Modified)			-	-	-
17	5	1	-	6	-	-	-	6	-	-	Soft Drnks Manufacturer	Yes	650	-	-	6	-	-	-	-	-
21	5	-	-	-	5	-	-	5	-	-	-	-	-	302.5	-	-	5	-	-	-	-
Strathclyde:																					
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	1 (Glass Recycling Co)					-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	8	31	3	8	31	-	4	2	-	2 Cncl	None	-	-	-	-	-	-	-	7 at	4/wk/bank	
18	3	-	-	3	-	-	1	2	-	-	-	-	600	-	-	2	-	-	1	-	-
19	6	-	-	3	-	3	-	6	-	-	None	-	683.16 (Standard '80) ('82)285 (Mini 5 cu yd)			7 (1 Stock)	-	-	-	-	-
11	6	-	-	6	-	-	-	5	-	1 Clng Depot	-	-	700	-	-	6	-	-	-	-	-
20	(Glass Recycling Company)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	2	5	-	2	5	-	2	3	1	1 Hsptl	Lawsons (Distillery) Ltd	Yes	550	UGC	-	2	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	7	-	-	7	9 3	Blk Ref Opn Skip	3	3	1	-	None	-	-	-	-	7	-	-	-	-	1
32	4	-	-	2	2 (Closed Skip)	-	-	-	-	2 Shopping Areas		-	700	-	-	1	-	-	-	-	-
Fife:																					
10	15	-	2	3	28	-	2	5	-	10	Some Local Firms	No	700	-	-	6	-	-	-	-	-
27	12	-	-	4	8	-	-	12	-	Nil	-	-	500	250	-	4	8	-	-	-	-
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE D6.2 Survey Results (Continued)

CNCL CODE	No OF CNCL	BANKS IND	BANKS OTHER	TYPE OF SKIPS: BANKS	MODULAR	OTHER	LOCATION: SPMKT	CARP	CAS	OTHER	OTHER SOURCES	RETURN	COST OF SKIPS: BANK	MODULAR	OTHER	NO PURCHASED BANK	MODULAR	OTHER	HIRING BANK	MDULR	SPNSHP
Dumfries & Galloway:																					
26	2	-	-	2	-	-	1	1	-	-	-	Yes	645	-	-	2	-	-	-	-	-
Tayside:																					
9	6	-	-	6	-	-	1	1	1	3 Shpng Prcncts Charge	1 Firm/1 Hospital 86 Pubs/clubs 20.50 pa for each 8 doz bottles collected weekly		200 (Modified)			-	-	-	-	-	-
28	4	4	-	4	8	-	1	7	-	-	-	-	650-750	250	-	4	UGC	-	-	-	-
Lothian:																					
13	22	13	-	25	23	-	-	-	-	-	-	-	-	-	-	25	UGC(23)	-	-	-	-
12	12	4	-	4	11	2	4	7	-	5 Hotels/ Pubs	1 Milk Creamery 1 Milkk Dist Dep Collection run of Licensed premises	Full Return		250	30gln Oil Drum	0	8	2 Oil Drums	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	6	-	-	6	-	-	-	6	-	-	Pulveristion Plant	Yes	700-800		-	6	-	-	-	-	-
Borders:																					
14	4	-	-	4	-	-	-	4	-	-	NOV-MARCH if have spare vehicle capacity, do wkly pubs/licensed premises run		500 (mdfied at cost) 324 (Local F E Clge)			3 1	-	-	-	-	-
30	3	-	-	1	4 Bttle Tnks		-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Central:																					
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	6	8	-	6	16	-	2	5	-	7 Access sites to shopping areas	Pulverisation Plant	N/A	850	-	-	4	-	-	-	-	-
31	5	3	-	5	6	-	2	6	-	-	-	-	800	-	- 0.23t/skip	5	-	-	-	-	-

TABLE D6.3 Survey Results

CNCL CODE	LITTER	NO	STORAGE	BAYS	CNCL	EQUIPMENT SKIP LIFTER	MECH SHOVEL	ADMINSTRTN	SPTLY ACTD	AVGE CONTENTS BANKS (Tonnes)	MODULAR BANKS	CAPACITY BANKS (Tonnes)	MODULAR BANKS	AVERAGE RATE OF FILLING PER WEEK (Tonnes)	DISTANCE TO PROCESSOR SURVEY (Miles)	GMF
Grampian:																
1	60	-	-	2	Y	25,000	-	-	N	1.56	-	3.0	-	1.56t/wk	120	97
2	57	4	600	2	Y	Existing vehicles		-	N	3.00	-	3.0	-	2.12t/wk	130	-
17	Nil	-	1900	2	Y	-	22,000	-	Y	2.5-3.0-		3.5	-	0.50t/wk	120	-
21	None	-	300	2	Y	Incorporated as extra on vehicle - used in Bulk Bin Hotel Collections		Not Charged	-	1.5	-	1.5	-	n.k.	75	-
Strathclyde:																
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	10	2	(Glass Recycling Company)					-	N	1.0	-	1.5(5 cu yds)		0.71t/wk/skip	58	44
7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	N/A			2,118 p.a.		-	N	3.0	0.82	4.0	0.5	11.07t/wk(schm)	N/A	26
18	-	-	-	-	N	-	-	-	N	3.0	-	3.0	-	1.0t/wk 0.2t/wk 0.1t/wk	15	24
19	Nil	-	Nil (Within overall rating of depot)		Y	10.10/uplift 350 p.a. Other: 42.5/load to centre	12.95/hr (Incl in overal shovl costs)	-	N	4.0	-	5.0	-	2.0t/wk for 6 Bttle Banks	58	40
11	50	6	Transprted to Glasgow 20/load			N/A			N	2.3	-	3.35	-	0.5t/wk/skip	30	27
20	(Glass Recycling Company)								-	-	-	-	-	-	-	-
24	30	2	N/A			10.0/hour		-	N	2.48	0.9	3.0	1.7	0.4t/wk	12	18
25	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
29	-	-	2000	2	Y	-	-	-	N	1.32	-	3.16	-	0.86t/wk	-	29
32	45	2	-	-	-	-	-	15	N	3.0	-	1-4	1-3	0.88t/wk	20	17
Fife:																
10	20	-	-	-	-	N/A		-	N	5.0	-	5.0	1.0	2.0t/wk	14	12
27	60	12	750	1	Y	Total: 3,830		100	Y	3.14(10cu yd) 3.62(14cu yd)	0.5	4.0	0.5	3.5t/wk for total scheme	30	40
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE D6.3 Survey Results (Continued)

CNCL CODE	LITTER	NO	STORAGE	BAYS	CNCL	EQUIPMENT SKIP LIFTER	MECH SHOVEL	ADMINSTRTN	SPTLY ACTD	AVGE CONTENTS BANKS (Tonnes)	MODULAR BANKS (Tonnes)	CAPACITY BANKS (Tonnes)	MODULAR BANKS (Tonnes)	AVERAGE RATE OF FILLING PER WEEK (Tonnes)	DISTANCE TO PROCESSOR SURVEY (Miles)	GMF (Miles)
Dumfries & Galloway:																
26	80	2	100 p.a.		N	Hired as required		-	Y	3.0	-	3.0	-	2.9t/wk	120	71
Tayside:																
9	Nil		Nil	1		25,000		< 200		1.0	-	1.5 5 cu yds	-	0.71t/wk/skp	58	44
28	35	8	Nil	1	Y	Necessary items existed		-	N	2.75	0.3	3.0	0.5	0.8t/wk	33	23
Lothian:																
13	-	-	-	-	-	-	-	-	-	1.7	-	3-4.0	-	Varies	40	25
12	Nil Reposition	-	Demountable Body			Existing	-	-	-	3.3	0.7	-	-	-	-	30
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	15	6	Nil			13.5/hr	-	-	N	2.0	-	10 cu yds	-	>4.0	22	14
Borders:																
14	10	4	900	1	Y	10.59/hr 130 - bulk haulage to Alloa, for 20 tonnes	10.15/hr	Not Costed		1.5	-	2.0	-	0.8t/wk	65	50
30	-	-	100	2	Y		250 p.a.	100	Y	1.25	0.5	1.5	0.5	1.5t/wk	130	
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Central:																
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	58	14	1000	2	Y	10/uplift 580 p.a.	240 p.a.	-	N	2.5	0.5	3.5	1.0	0.2t/wk/skp	12	6
31	60	8	N/A			13.0/hr (1 hr requd)		-	N	2.8	0.9	5.0	1.5	3/week 0.23t/skip	7	6

TABLE 7E.4 Survey Results

CNCL CODE	BULK /Tonne	TRNSPRT CNCL	TRIPS	BULK /T	LDNG SPTL ACTD	PRICE RECEIVED (/tonne) CLEAR	GREEN	MIXED	WASTE REMIT (Y/N)	DISPOSAL TO BNK A/Cts	A/Ct VALUE	ADVERTISEMETS Y/N	PSTRS	NPAPR	OTHER	ON BANKS	WHAT	INSURANCE SPTLY A/Ctd	COST
Grampian:																			
1	8.30	Y	4/Mnth	-	N	-	-	18.50	N	-	-	N				N		N	-
2	7.50	N	1/2Mnths	Minimal		-	-	18.50	N	-	-	Y	Free Local Press			Y		N	Minimal
17	7.00	N	1/2-3Mth	n.k.		22.50	-	18.50	N	-	-	Y	(At Outset Only)	40		N		N	
21	7.50	N	1	Not Estimated			-	18.50	N	-	-	Y	GMF			N		N	n.k.
Strathclyde:																			
3	-	-	-	-	-	-	-	-	-	-	-	-				-		-	-
5	-	-	-	-	-	-	-	-	-	-	-	-				-		-	-
6	N/A	N	1/2Mths		N/A	To Glass Rec Co			N	-	-	Y		60		N			N/A
7	-	-	-	-	-	-	-	-	-	-	-	-				-		-	-
8	-	-	-	-	-	-	-	-	-	-	-	-				-		-	-
16	4.0	N			N/A	UGC	2/tonne	18.00	N	-	-	-				N		Included In Rental	
18	3.0	N			n.k.	25.00	-	-	N	-	-	Y		Articles		N		N	-
19	42.50/load 9.71/tonne	Y		Included		-	-	18.50	N	-	-	Not Regular Initial & Intermittent P.R.				N	(Only where are)	N	Block Insurnce
11	3.0	N	4-5/	-	-	22.50	-	18.50	Y	Y	18.50	Y	(Within limits of available finance)			N		:	N/A
20	(Glass Recycling Company)				-	-	-	-	-	-	-	-				-		-	-
24	4.0	N		No		-	-	18.50	N	-	-	Y	272			N		N	-
25	-	-		-	-	-	-	-	-	-	-	-				-		-	-
29	2.87		16/yr	0.58	N	22.50	-	18.50	N	-	-	Y	0	0		N		N	-
32	2.5	N		-	-	-	-	20.00	N	-	-	Y	10			N		-	-
Fife:																			
10	8.0	Y	2		N/A	22.00 UGC Bins	- 2/tonne	18.50		-	-	Y			50	N		N	No Idea
27	4.0	N	1	No		22.50	-	18.00	N	-	-	Y	350	50		N		N	-
22	-	-	-	-	-	-	-	-	-	-	-	-				-		-	-

TABLE D6.4 Survey Results

CNCL CODE	BULK TRNSPRT /Tonne	CNCL	TRIPS	BULK /T	LDNG SPTL ACTD	PRICE RECEIVED CLEAR (/tonne)	GREEN	MIXED	WASTE REMIT (Y/N)	DISPOSAL TO BNK A/Cts	A/Ct VALUE	ADVERTISEMETS Y/N	PSTRS	NPAPR	OTHER	ON BANKS	WHAT	INSURANCE SPTLY A/Ctd	COST
Dumfries & Galloway:																			
26	7.26	Y	1-2	1.26		22.00	-	18.50	N	-	-	Y	Free Pub in Locals			N		Y	General
Tayside:																			
9	5.6	Y	3	Nil		-	-	18.50	N	-	-	N				N		N	
28	4.0	Y	1/Mnth	0.10	N	-	-	18.00	N	N	-	Y	50			N		N	
Lothian:																			
13	-	Y	-	Neg	N	22.50	-	18.50	N	-	-	N						N	
12	CNCL-GMF											Y	10			N		?	
23	-	-	-	-	-	-	-	-	-	-	-	-				-		-	
34	5.0	Y		Nil	-	-	-	18.50	-	-	-	Y	Sppld by GMF			N	N/A	N	Part of WDLC Emplyee Liab
Borders:																			
14	6.5	Y	5 p.a.	0.5	N	-	-	21.00	-	-	-	Y		Articles		N		N	
30	70.0/ld	Y	2	10.0/ld		-	-	18.50	N	Y	-	Y	Sppld by GMF			N		N	96
33	-	-	-	-		-	-	-	-	-	-	-				-		-	
Central:																			
4	-	-	-	-		-	-	-	-	-	-	-				-		-	
15	1.2	Y	-	0.66		22.50	-	18.50	N	-	-	Y	Nil			N		N	
31	4.0	Y	-		N/A	-	-	-	N	-	-	Y	50	20		N		N	N/A

TABLE D6.5 Survey Results (Continued)

CNCL CODE	UPLIFT	CNCL/CNTRCT	SITE MNTNANCE SPTLY	A/Ctd	GNRL BDGT	BANK MNTNANCE	GRANT	TONNAGE: YEAR	CLEAR (Tonnes)	MIXED (Tonnes)	TOTAL (Tonnes)	AVRGE DISPOSL COSTS LANDFILL (/tonne)	INCIN (/tonne)	OTHER (/tonne)	AVERAGE COLLN COSTS (/tonne)	LINKS TO CHARITY Y/N	BNFTS WHICH	FTRE
Grampian:																		
1	10/load	CNCL	-	N	Y	300/yr		82/83		361	361	3.0	12.50	-	18.16	N		N
2	12	CNCL	Minimal	N	Y	None Yet		83/84		110	110							
17	15	CNCL	n.k.	N	Y	Nil	No		62	38	100	11.0	-	-	34.00	N		
21	Not Assessed Colln Vehicle at end of round		Not asesed			Not accntd		83/83 April		139	139					N		N
Strathclyde:																		
3	-	-	-	-	-							-	-	-	-	-		-
5	-	-	-	-	-							-	-	-	-	-		-
6	N/A	CNTRCT	(Glass Recycling Company)							17	17	1.63	-	-	15.75	N		Y
7	-	-	-	-	-					-	-	-	-	-	-	-		-
8	-	-	-	-	-					-	-	-	-	-	-	-		-
16		UGC		N	Y	Included in Rental		82	BNK: 55.14 BIN:167.58	169.69 139.55	531.96	N/A	-	-	-	Y	Yorkhill Hospital	
18	10	CNCL	n.k.	N	Y	-	-									N		Y
19	10.10	CNCL	N/A	N	Y	-	-	82/83 Sept		105	105	10.0	12.00	-	9.14	N		N
11	20	CNTRCT	Minimal	N	Y	100	No				131.18	-				N		N
20	(Glass Recycling Company)							-	-	-	-	-	-	-	-	-		
24	10	CNCL	Nglgble	N	Y	None yet	No	82		19.86	19.86	2.00	-	-	19.00	N		N
25	-	-	-	-	-			-	-	-	-	-	-	-	-	-		
29	4.6	CNCL	Nil	N	Y	None to date		82	89.2	121.4	210.60	N/A	18.00	N/A	21.67	N		Y Not Decided
32	25+VAT	CNTRCT			Y	25		82/83		92.0	92.00	4.0	-	5.8 Pulverisation	24.00	N		n.k.
Fife:																		
10	40	CNCL	Nil	N	Y	-	NO		60.0	46.75	106.75	n.k.				N		Doubt it
27	22	CNTRCT	Nglgble	N	Y	100	50			191.09		N/A				N		
22	-	-	-	-	-	-	-					-	-	-	-	-		

TABLE D6.5 Survey Results (Continued)

CNCL CODE	UPLIFT	CNCL/CNTRCT	SITE MNTNANCE	SPTLY A/Ctd	GNRL BDGT	BANK MNTNANCE	GRANT	TONNAGE: YEAR	CLEAR (Tonnes)	MIXED (Tonnes)	TOTAL (Tonnes)	AVRGE DISPOSL COSTS LANDFILL (/tonne)	INCIN (/tonne)	OTHER (/tonne)	AVERAGE COLLN COSTS (/tonne)	LINKS TO CHARITY Y/N	BNFTS WHICH	FTRE
Dumfries & Galloway:																		
26	15	CNTRCT	N/A	N	Y	N/A		82/83		150.62						N		N
Tayside:																		
9	11	CNCL	0.15/load	N	Y	10/skip/yr	50			350	350	-	12.00	5.49 Pulverisation	19.37	N		
28	6	CNCL	-	N	Y	10/skp/yr	NO	82		185	185	2.50	7.00	-	3.00	N		N
Lothian:																		
13	10	CNCL	-	N	-						1300	-	-	-	-	N		
12	?	CNCL/GMF	-	-	Y	5						-	-	-	-	N		
23	-	-	-	-	-	-	-				-	-	-	-	-	-		
34	13.5/hr	CNCL	Nil	-	Y	-	YES				213	>4.00	-	-	-	N		
Borders:																		
14	10	CNCL	-	-	Y	So far nil Est 50 p.a.		82/83		98	98	6.0	-	-	32.00	N	Undecided	Y
30	4	CNCL	-	N	Y	20	NO				220	8.0	-	-	10.00	N		N
33	-	-	-	-	-	-	-					-	-	-	-	-		-
Central:																		
4	-	-	-	-	-	-	-					-	-	-	-	-		-
15	10	CNCL	Nil	-	-	20	60/skip		85	60	145	5.57	-	-	-	N		n.k.
31	13	CNCL	6.00	N	Y	30	15	82		140	140	12.00	-	-	18.00	N		N

TABLE DE.6 Benefits Of Glass Recycling

NATIONAL	
National Effort	31, 34
Saving in Natural Resources	1,6,21
- Conserves sand sources	15
- National Energy Saving	2,11,14,31
Minimal Reduction in Energy usage by GMF	9
- Reduces power requirements at glass works	15,24
Reduced Cost of Glass Products	6,15
New Bottles More Hygienic	15
Service to the Public	1
ENVIRONMENTAL/CONSERVATION IDEALS	
Brings Conservation Ideals Closer to public	6,11
- Keeps public mind on seeing waste as resource	15,24
- Public awareness in waste disposal functions	28
- Public participation	19
- Gives conservations opportunity to save something and keeps them off my back	9
Environmental improvement	14,19
- Encourages public to be more environmentally conscious	17
Good sense saving or recycling any resource	11
LOCAL	
Reduction in Costs (Waste Disposal)	1,11,18,24,31
- Less refuse to dispose of locally	2,11,12,17,24
- Divert glass from landfill	14,15,21,29
Treatment Plant	29,32
- Slight reduction in weight of domestic waste collected	6,12,32
Income (Reduction in Disposal Costs)	12,14,18,29,34
- Makes some refuse pay for its self	15
- Economic credit to L.A. & hence Ratepayer	28
- Operational profit	19
OTHER	
As Part 1 (Qn 3)	10,26
(Qn 8a)	30
No Response	27

TABLE D6.7 Problems In Operating Bottle Banks

Litter (Cardboard Boxes)	31
Lack of sites for Public Bottle Banks	1
prime sites, i.e. Supermarkets	28
Access - cars parked in front of Banks	9
Distance to Recycling Plant	1
- haulage costs/payload	24
Too few concentrated centres of population (rural)	17,27
- largest town 17,000	2
- largest concentration 12,000	6
- 520 sq mile area	14
Vandalism	12,15,32
- Extract and smash bottles	9,29
- Door locks broken	29
- Spray painted	29
Noise	27
Filling one side of skip	15
- Filling Rate	17,18
- Poor public response	24
No Problems	10

TABLE D6.8 Future Developments

Increasing role of Local Authorities	1
Separate Licensed premises collection	2,12,29
- Commercial Properties	24
- Greater participation & practical input by those industries & commercial undertakings directly involved in the production of waste glass	28
More smaller bins for smaller population centres	2,11
- Expansion to other sites/villages	10,30
- Limited to Civic Amenity Sites	34
Location for a few days per week at various sites	14
Emphasis at School on recycling, and its development as a habit	15
More Community involvement	18,27
As population increase, demand from Community Councils increases	21
Increase in use of Returnables	31
Increase in Government support	32
Possible reduction in weight of domestic refuse collected and disposed of due to increase in types of materials being recycled	6

TABLE D6.9 Other Factors

Banff - More grants should be available for Bottle Banks to encourage expansion of the service.

Dundee - If Bottle Bank system is to be effective why are there no private firms, providing, installing, emptying and selling to Alloa.

Ettrick - Costing to a degree is irrelevant. For a total budget of 400,000 to collect and dispose of 10,000 tonnes of valueless refuse, it is well worthwhile collecting a commodity for which some financial gain is made.

Falkirk - TV adverts by Government and Industry. Schools should highlight resources and reduction of waste which uses energy in its raw material phase than its destruction. Real waste would seem to be energy.

W Lothian - Increased publicity should be constantly carried out, preferably by Glass Industry with Government support.

Appendix E

Social Factors

LIST OF COUNTY COUNCIL INVOLVEMENT WITH THE BOTTLE BANK SCHEME

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of DC's with scheme compared to total no DC's in area	ACTION
NON METROPOLITAN AREAS			
AVON	12.86	1:6	Not known.
BEDFORDSHIRE	1.53	2:4	Have met with the DCs to discuss glass recycling. One DC has 'gone it alone' and another has a Modular scheme using a contractor. Storage facilities were offered in 1980, but not taken up. The CC have located Bottle Banks on 3 civic amenity sites. No rebate is offered as the savings are considered too small.
BERKSHIRE	14.85	5:6	Approve of the DCs recycling glass. No rebate is given for their efforts, but storage facilities are provided, plus handling arrangements. Bottle Banks are sited at CC transfer station and civic amenity sites.
BUCKINGHAMSHIRE	3.01	4:5	The DCs select sites and are respossible for the collection . 2 CC civic amenity sites recycle glass . No rebate is given as there is no benefit to the rate-payers. (NB rebate is given for waste paper £1.50 per ton).
CAMBRIDGESHIRE	N/A	3:6	Support the reclamation of waste materials provided it can be performed economically. They currently provide a rebate of 25p per tonne for glass collected by Cambridge City Council. It is so low because the cost of waste disposal is so low and thus savings are marginal.

Contd/ ......

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of DC's with scheme compared to total no DC's in area	ACTION
CHESHIRE	2.71	4:8	Co-ordinate glass recycling in area, provide storage facilities and mechanical shovel for loading glass.
CLEVELAND	6.44	1:4	Not known.
CORNWALL	1.44	1:6	As yet, they do not assist/encourage glass recycling in their area, but they do have a person responsible for recycling and help co-ordinate the recycling of waste paper & oil.
CUMBRIA	3.27	4:6	Pay a rebate for £1.50 per tonne to each DC who provide Bottle Bank sites. A private company is responsible for collecting the glass and shipping it to the Recycling Plant, so no facilities offered by CC. CC encourages the promotion of scheme.
DERBYSHIRE	5.47	1:9	Allowed a Bottle Bank to be sited at one of their civic amenity sites.
DEVON	4.76	5:10	Were responsible for setting up and operating glass recycling schemes in area. A private contractor services the Bottle Bank Scheme in 2 DC areas areas. The other schemes are operated with the assistance of the DCs and contractors are responsible for emptying the Bottle Banks. The CC own the Bottle Banks and intend to have a scheme in all DC areas provided it can be achieved economically.
DORSET	7.64	2:8	The existing schemes are run totally by the DCs. However, the CC plans to co-ordinate and launch a recycling scheme in the South-East area of Dorset.
DURHAM	3.48	3:8	The DCs operate the Bottle Bank schemes in their areas, but the CC has assisted and co-ordinated its introduction. At inception the CC gave grants for the construction of storage bays: Durham (£500) and Darlington (£). The CC provides skip moving vehicles to service the Bottle Banks at a reduced rate.

Contd/ ......

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of DC's with scheme compared to total no DC's in area	ACTION
EAST SUSSEX	4.64	7:7	Co-ordinated and set up a county wide Glass Bank scheme with the co-operation of all the DCs. The scheme is operated by a private contractor. Day to day matters are dealt with by the DCs, but the CC deals with its overall co-ordination and policies. No assistance is required as these are provided by the contractor. The majority of the scheme's income is passed on to the DCs. No rebate is given as it is seen as inappropriate.
ESSEX	5.11	12:14	They operate two Large Bottle Bank schemes in Chelmsford and Colchester i.e., they are responsible for siting, emptying the Bottle Banks and storing the glass before transportation to the Recycling Plant. No financial rebate has been offered to the remaining DCs as the savings were considered too small. However, advice and assistance has been give to DCs, many of whom now have a private contractor operating a Modular Scheme for them.
GLOUCESTERSHIRE	2.84	6:6	All the Schemes in the area are operated and run by the DCs. No DC has approached the CC for assistance, so none has been given (they had offered storage facilities and equipment). However, the CC has offered a rebate of £3.00 per tonne to the DCs, if they make a loss in operating their Schemes.

Contd/ ......

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of DC's with scheme compared to total no DC's in area	ACTION
HAMPSHIRE	5.98	11:13	All the Schemes in the area are operated/run by the DCs. However, the CC encourages the introduction of Schemes and has contributed £500 to the DCs (for building some storage bays) to help in the setting up costs. They have provided and operate a storage compound where the bays were built, which is used by many DCs. They are also in the process of providing another such facility in the area. (NB the land and weighbridge are free) No rebate is given as only marginal savings are believed to be accrued in waste disposal.
HEREFORD & WORCESTER	3.60	5:9	Paid for part of the construction of storage bays in Hereford and Wyre Forest (i.e., £3,200).
HERTFORDSHIRE	8.08	9:10	Wish to assist in glass recycling provided it is self-supporting. 2 DCs operate their own Large Bottle Bank schemes and Modular schemes operated by contractors cover the remainder. No rebate is offered as there is considered to be no savings in waste disposal costs.
HUMBERSIDE	6.87	5:9	Have recently embarked on a conttractor operated Modular Bottle Bank Scheme in conjunction with the DCs. They are keen to see it expanded. The Large Bottle Bank scheme was originally operated in 2 DC area. No rebate is given.
ISLE OF WIGHT	6.64	2:2	Have been responsible for the setting up of a trial Large Bottle Bank Scheme with the co-operation of the BCs. They intend expanding the Scheme to cover every town on the island.

Contd/ ......

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of DC's with scheme compared to total no DC's in area	ACTION
KENT	5.33	12:14	In 1980, the CC helped DCs set up a Large Bottle bank Scheme by constructing a central storage depot, negotiating a cullet price with the local glass manufacturer and arranging bulk transport to the Isle of Sheppey. Giving the DCs a rebate is currently being considered by the CC. The remaining schemes are operated by private collection firms using a Modular Scheme.
LANCASHIRE	4.04	10:14	Wish to encourage recycling of materials where it is economic to do so. They offer either a rebate of £1.00 per tonne of glass recycled in the County or free storage facilities when suitable and available. They have also provided Bottle Banks at several household waste disposal centres. A Recycling Officer has also been appointed on an MSC scheme for 12 months.
LEICESTERSHIRE	7.29	2:9	Have offered the use of storage facilities and equipment to the DCs, but this has not been taken up. No rebate is offered.
LINCOLNSHIRE	3.17	6:7	The CC is responsible for co-ordinating glass recycling in its area. One DC operates a Large Bottle Bank Scheme on its own and the remainder have Modular schemes operated by a private collection firm. The DCs chose the sites and also gain from commission on the glass collected. No rebate is given as the CC consider the schemes should be self-financing.

Contd/ ......

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of DC's with scheme compared to total no DC's in area	ACTION
NORFOLK	4.72	6:7	They co-ordinate and operate a Bottle Bank scheme in all DC cases except one, where the DC has a private contractor perform the service for them. This means they have purchased the Bottle Banks (some are sponsored), empty them and store glass prior to transport to the recycling plant. A wandering Bottle Bank visits 4 towns on a monthly rota. They have CC offered the use of its storage facilities to the DCs should they want to operate their own schemes.
NORTHAMPTONSHIRE	3.65	5:7	All the schemes are operated by the DCs under the coordination of Northampton Borough Council. Even so, the CC has Bottle Banks at 3 civic amenity sites. The CC plans to have Bottle Banks at all its civic amenity sites and is currently considering whether to offer a rebate to the DCs. They would like to see the scheme expand particularly in the north of the county.
NORTHUMBERLAND	2.12	2:6	In principle, they recognise that BBs save them money, and are considering offering a rebate to the DCs and providing storage bays.
NORTH YORKSHIRE	5.34	4:8	All the schemes are operated by the DCs themselves or with some help from private contractors. There is no policy to give a rebate as the saving is considered unquantifiable. However, should assistance be required to site Bottle Banks or store the glass this would be granted.

Contd/ ......

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of DC's with scheme compared to total no DC's in area	ACTION
NOTTINGHAMSHIRE	7.30	5:8	The CC has actively encouraged a number of the DCs to set up Bottle Banks schemes; some of whom now have a private contractor operating a scheme for them. Two of the DCs operate their own scheme. The CC has not offered storage facilities or equipment as the need has not arisen. No rebate has been offered as the savings were considered to small.
OXFORDSHIRE	3.28	5:5	They set up the first Bottle Bank scheme in conjunction with Oxford City Council and encouraged the other DCs to set up schemes. In the interest of reducing administration costs, the CC's active participation in the scheme was withdrawn and a rebate of £3.50 offered for every tonne of glass recycled by DCs.
SHROPSHIRE	3.24	1:6	Offer to one DC and one charitable organisation a rebate of £2.00 per tonne recycled. This applies to glas and other materials too. Also discus recycling with DC.
SOMERSET	3.66	0:5	The CC is keen to see a glass recycling scheme set up in the county, but all investigations to date have shown that it would be uneconomic. They have initiated all discussions and investigations. Private contractors have been approached on many occasions.
STAFFORDSHIRE	5.58	4:9	They have discussed glass recycling with the DCs and now provides storage space and loading facilities for 3 DCs' Bottle Bank Schemes. The DCs are responsible for their own scheme i.e. the purchase of Bottle Banks, their siting and emptying.

Contd/ ......

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of DC's with scheme compared to total no DC's in area	ACTION
SUFFOLK	4.24	3:7	The Council co-ordinated meetings with all the DCs in their area in order to set up a County Scheme. Some DCs now have a scheme run by a private contractor. They also offer a £1.00 per tonne rebate to its DCs.
SURREY	9.46	9:11	All the glass recycling schemes are operated by the DCs in conjunction with 2 private contractors. The CC supports glass recycling where viable, but has not assisted its operation or expansion.
WARWICKSHIRE	2.66	4:5	Not known.
WEST SUSSEX	9.28	6:7	All the schemes are operated by the DCs in conjunction with a contractor, and no involvement is seen as necessary from the CC. No rebate is offered.
WILTSHIRE	7.20	2:5	Consider glass recycling the responsibility of the DCs. They consider the scheme to be uneconomic because the distance to a recycling plant and the rural nature of the county increase the transport costs.
AVERAGE OF NON METROPOLITAN AREAS	5.06	179:296	

Contd/ ......

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of BC's with scheme compared to total no BC's in area	ACTION
METROPOLITAN AREAS			
GREATER MANCHESTER	9.62	10:10	Not known.
MERSEYSIDE	6.80	2:5	Offer a rebate of £1.5 for every tonne recycled.
S YORKSHIRE	3.19	4:4	Responsible for setting up and operating a county-wide Bottle Bank scheme, which consists of 20 Large Bottle Bank sites and the recent introduction of a Modular Bottle Bank scheme. The Large Banks are owned/emptied by the CC, but the Modular scheme is operated by a contractor on their behalf. Any profits made go towards funding environment improvement projects.
TYNE & WEAR	7.92	1:5	Offered use of existing storage depot. No rebate.
W MIDLANDS	14.76	5:7	The CC is responsible for and operates a Large Bottle Bank scheme in 2 DC areas, and is considering an expansion. No rebate is given, but a set of guidelines has been adopted under which payments will be made for suitable schemes.
W YORKSHIRE	7.64	5:5	Work is conjunction with 4 DCs in recycling glass through the Bottle Bank Scheme. They have provided separate storage facilities for each of the DCs. The DCs site the Bottle Banks and empty them at the storage bays provided. The CC arranges for the glass to be sent to the recycling plant and load the glass onto the vehicle free of charge. Some Bottle Banks are also sited on household waste sites. No rebate is given as the above assistance is considered quite sufficient.
AVERAGE METROPOLITAN AREAS	8.46	27:36	

Contd/ ......

COUNTY COUNCIL	Cost of disposing a tonne of refuse (in £)	Ratios of BC's with scheme compared to total no BC's in area	ACTION
GLC			
GLC	13.68	17.33	They actively encourage the development of glass recycling as part of its environmental policy. 8 BCs operate their own Large Bottle Bank schemes the remainder are operated by contractors, usually using a Modular system. The GLC pays each BC a rebate of £7 for every tonne of glass recycled. All the GLC civic amenity sites have been offered as Bottle Bank sites. The GLC operates Bottle Banks at 5 civic amenity sites. The GLC has also built a storage facility in North London which can be used by any nearby BCs. They have also offered specialist vehicles to operate Modular schemes in the area. They have appointed a Waste Recycling Co-ordinator, who works closely with the BCs. Other assistance includes the provision of promotion/publicity material and financial aid for joint BC schemes.
ENGLISH COUNTIES	6.93	223:365	

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Appendix E

E.2 Litter

E.2 Alternative Control - The Keep Britain Tidy System

E.2.1 Introduction

Instead of legislation taking the dominant role in litter control, the Government through the Keep Britain Tidy Group (KBTG) are looking to develop educational programmes. The KBTG spent £250,000 in 1977, £400,000 in 1978, £1 million in 1981 and £1.6 million in 1982. This level of funding is from two prime sources: The Department of the Environment gave a grant of £318,000 and the Manpower Services Commission made £1,103,750 available for education and community programmes in 1982.

In Scotland, the work is carried out through the Keep Scotland Tidy Campaign (KSTC). They are moving away from looking at litter control to actions to motivate litter prevention. To this end they have developed the Keep Britain Tidy System (KBTS) which developed from campaigns conducted in Australia, Canada, America and in some British Cities.

E.2.2 The Keep Britain Tidy System (KBTS)

The KBTS is a method for improving waste and resource management and of reducing litter in town and countryside. It has four distinct features:

1. Sources of Litter.
2. Attitudes.
3. Measurement.
4. Community Involvement.

The System identifies seven main sources of litter: five are the result of mishandled rubbish and waste by people at work and at home and two are the result of littering by pedestrians and motorists. These include:

1. Mishandled household rubbish put out for collection.
2. Mishandled commercial and industrial storage of rubbish and waste.
3. Improper storage and handling of rubbish and waste on construction and demolition sites.
4. Improper loading and unloading of vehicles.
5. Uncovered vehicles.

6. Pedestrians.
7. Motorists.

Having identified the sources of litter, the System seeks community involvement to tackle the problem. The objectives are to change people's attitudes towards littering and to reduce the amount of litter found in the community. To encourage community support, the system identifies the key figures who are encouraged to support the scheme. The System identifies the following key figures:

Local Authority Members who decide priorities and policies in terms of rubbish within the District.

Local Authority Officers who advise and carry out the policy

Business leaders who are involved in waste management.

Local Community Leaders.

Education Authority Officers and Teachers.

Media Representatives.

The System has been successful in many countries and in towns in Britain. The key to the success has been the measurement of litter to provide a yardstick over which comparisons can be made. To establish quantifiable data photometric measurements have been adopted. It involves the production of a photographic record established in line with demographic and geographic nature of the community. Once every 3 months photographs would be taken at the same spot and at the same time each day for comparisons to be made. The System is a long term process.

The aim of the system is to provide a permanent change in public attitudes:

ATTITUDE ⟶ BEHAVIOUR ⟶ SYMPTON
Attitude ⟶ Wrong Practice ⟶ Litter

The system is a comprehensive method requiring effective organisation in order to acheive the necessary change. It operates under the guidance and direction of the local authority, based on an Action Plan.

The Action Plan has 5 main parts:

1. Local Authority review of litter control and waste management services including the identification of the sources of litter.

2. Local Authority review of Laws, By-Laws, Regulations and Codes of Working Practice.

3. Examination and review of policy and practices relating to law enforcement.

4. Public information and education programme aimed at specific sectors of the community. This includes the KBTG Environmental Education Programme for schools, the Youth Action Pack for youth groups, the Tidy Team Programme for Industry and the Handbook for Catering Establishments.

5. Re-use and recycling of resources.

Recycling is a clear part of the system. If effective, it can reduce the level of littering in an area. The System has been successfully adopted across Britain by Local Authorities. Litter needs to be treated as a coherent part of the Waste Management System.

The impact of returnables and legislation has been reviewed in Chapter 4.

E.3 Employment

Based on the lines of the 'Green Bin' system developed in West Germany (Section 5.4), Taunton Think Tank Limited (1984) outlined a proposal to create jobs from waste. There system is based on the fact that waste has to be collected from households, and must collect clean materials at source and keep them separate. There are two distinct functions: collection of dirty waste and the collection of reclaimable materials. Thus for maximum efficiency, TAUNTON see each area having a Reclamation Team equipped to collect materials and a separate team to collect the dirty waste.

TAUNTON notes that once 65%+ of materials reclaimed the volume of waste will be reduced sufficiently to permit collection to be made fortnightly. This would lead to a reduction in collection force by half. It would also lead to less use of specialist plant, equipment, energy and landfill sites. These savings will be required to fund extra jobs in reclamation.

TAUNTON estimates that 23,250 waste jobs would be lost, to be replaced by 48,500 reclamation jobs because it is more labour intensive. This is a net gain of 25,250 full time jobs. This is based on the assumption that there will be 100 full time workers involved in reclamation for each average sized collection authority.

Waste collection is known for taking toll on the health of workers involved. Reclamation work is less onerous and of an enhanced and more satisfying nature. It requires more manual dexterity, visual co-ordination and flexibility.

The TAUNTON System would provide a fortnightly service to alternate with waste collection services. The estimate assumes that the average remuneration for full time employment will be in £5,000 to £6,000 per annum range inclusive of National Insurance contributions. The Inland Revenue will benefit from tax take on extra jobs, and 25,250 individuals will no longer need to draw state benefits.

In addition, income from the sale of materials will be available to the Local Authority. TAUNTON view this change in collection practices could be incorporated into existing budgets, and will have long term benefits through treating waste as a resource.

The establishment of reclamation projects can create new jobs. In recycling a degree of sorting will be necessary to improve the marketability of the recovered product. This can be undertaken manually, and can lead to social benefits from the creation of new jobs. TAUNTON feels that young people 17 to 25 are particularly suitable. This is of importance as it is in this sector that unemployment is particularly severe.

E.4 Benefits From Employment

In their assessment of the Oxfam Wastesaver scheme, TURNER & BLACKMORE (1978) looked at how the benefits from employment can be assessed. They noted that there were a number of problems in assessing the value of work opportunities. This will be influenced by whether the work is done voluntarily or under a Government Job Creation Scheme.

In assessing recovery projects, the price of a factor input is the return that factor would have received from employment in the absence of such a project. This return, or the opportunity cost is taken as being equal to the market price of the input. For employment this would be the wage rate. However, in areas of high unemployment the market may be distorted which may result in a solution that is not optimal. In such cases TURNER & BLACKMORE suggest that shadow pricing where a factor is given a value that reflects the 'true' marginal social cost, may result in a more efficient allocation of resources.

The Opportunity Cost (OC) of employing an unemployed worker will depend on 3 factors:

- Leisure benefits which may be gained from unemployment (L_β).
- Costs of transport to work, or house removal (Rc).
- Non-Wage Benefits gained by virtue of being employed (E_β).

This can be represented as:

$$OC = L_\beta + Rc - E_\beta$$

The evaluation of leisure benefits, removal costs and non-wage benefits from being employed is an area that is subject to much controversy.

An alternative method of establishing the opportunity cost of labour is provided by:

$$OC = W - U_B$$

where: W = Wage Rate Sufficient To Attract Labour.

U_B= State Unemployment Benefits

Wage Rate (W) is set at a level that is sufficient to attract workers into work from being unemployed. Unemployment benefits represent a transfer payment from one section of society to another and as such do not enter into opportunity cost considerations. As payments are available only when unemployed it is argued that the Opportunity Cost of employment would be given by the difference between wage rate sufficient to attract a worker into employment and the level of unemployment benefits.

In practice the wage rate is influenced by a number of pressures: i.e. notions of equality and parity with other workers and minimum union rates. It is likely that the actual wage rate will exceed W and that the Opportunity Cost, OC, will overestimate social costs of employing the unemployed.

The actual social cost of employing previously unemployed worker is difficult to assess. The level of state benefits to which an unemployed person is entitled, depends on a number of factors:

family structure,
National Insurance Contribution records,
previous earnings, and
duration of unemployment.

TURNER & BLACKMORE estimated that in 1976 the income gained by the Government when an unemployed worker became employed would vary from 76.7% of average earnings for a single person, to 82.2% for a married person with two children. This assumes that employee

National Insurance contributions are paid by the private employer when a person accepts work. If the employer is the Government through the Manpower Services Commission the savings will be naturally reduced by 10.75% of earnings the rate of employer contributions. These factors need to be taken into account when looking at the possibility of setting up a recycling scheme to recover materials from waste.

Appendix F

The Glass Viability Model

Appendix F

F.1 SUMMARY TABLES

A. SET UP COSTS

1. SITE COSTS (SIC)

Administration Costs (SKA)...............
Tarmac Base (TAR) ....
Railings (RAI) ....
Cost of Litter Bins ....
Sub Total .....
Amortisation Period (T) ....
Car Park Revenue (CPR) ....

SIC = (((SKA + TAR + RAI + KL)/T) + CPR) ......

2. SKIP COSTS (SKC)

a. New Bank Costs (BKC)

Number of Banks (N) ....
Cost of Individual Banks ....
Life of Banks (IYC) ....
Interest Rate (PWLB) ....

$$BKC = \frac{N * BKC}{IYC} * 1 + \frac{PWLB * IYC}{100} ....$$

b. Modified Banks (MOD)

Number of modified banks (NMD) ......
Cost of Modified Banks (CMD) ....

$$MOD = \frac{NMD * CMD}{IYC} * 1 + \frac{PWLB * IYC}{100}$$

c. Sponsorship (SPN)

Number of Sponsored Banks (NSP) .....
Contribution of Sponsor (CSP) ....

SPN = (NSP * CSP) ....

SKC = BKC + MOD - SPN ....

SUMMARY TABLES

3. Storage Costs (STC)

a. Use Existing Sites ....

b. New Storage Sites (KS)
Cost of Construction (KS) ....
Life of Storage Sites (IYS) ....
Public Interest Rate (PWLB) ....

$$KS = \frac{KS}{IYS} * 1 + \frac{PWLB * IYS}{100}$$ ....

c. Hire Private Site (HPS) ....

d. Use Demountable Body (UDB) ....

4. Upfront Publicity Costs (UPC) ....

5. Crusher Costs (CRC)
Crusher Capital Costs (CAP)...............
Life of Crusher (IYC) ....
Interest Rate (PWLB) ....

$$CRC = \frac{CAP}{IYC} * 1 + \frac{PWLB * IYC}{100}$$

6. Summary

SET UP COSTS (SUC) =

Site Costs (SIC) ....
\+ Skip Costs (SKC) ....
\+ Storage Costs (STC) ......
\+ Upfront Publicity (UPC) ..
\+ Crusher Costs (CRC) ......
TOTAL ....

SUMMARY TABLES

B. OPERATING COSTS (OPC)

1. Collection Costs (CC) ....per skip
   / 3.0 ....per tonne

2. Site Maintenance (SM) ....
   / 3.0 ....per tonne

3. Skip Maintenance (SKM) ....
   / GRT ....per tonne

4. Administration (KA) ....
   / GRT ....per tonne

5. Publicity (PUB) ....
   / GRT ....per tonne

6. Bulk Transport (TR) ....per tonne

7. Bulk Loading (TL) ....per tonne

8. Storage Maintenance (STM).................
   / GRT ....per tonne

9. Crusher Operating Costs (CUC) ....
   / GRT ....per tonne

10. Summary:

    OPC = CC + SM + SKM + KA + PUB + TR + TL STM + CUC

GRT = Annual Tonnage Recovered

SUMMARY TABLES

C. INCOME

1. Revenue (TRA)
   a. Clear Glass: P1 * PCG * GRT ....
   b. Green Glass: P2 * PGG * GRT ....
   c. Amber Glass: P4 * PAG * GRT ....
   d. Mixed Glass: P3 * PMG * GRT ....
   TOTAL ....
   e. Return From Private Operator
   2 per tonne ....

   TOTAL REVENUE (TRA) ....

2. Disposal Cost Savings (SRD)
   a. Average Landfill Costs ....per tonne
   b. Incineration Costs ....per tonne
   c. Other Costs ....per tonne

   SRD = Y * Diverted Waste ....
   Y = Average Disposal Cost

3. Savings In Collection Costs (SCC)
   a. Average Collection Costs (R) ....per tonne
   b. Quantity Of Waste Diverted (Q)........tonnes

   SCC = R * Q

4. Summary

   INCOME =
   Revenue (TRA) ....
   + Disposal Cost Savings (SRD) ....
   + Savings In Collection Costs (SCC)..........
   TOTAL ....

SUMMARY TABLES

D. NET COSTS

1. Operating Surplus (PPT)

Revenue (TRA) ....
\- Set Up Costs (SUC) ....
\- Operating Costs (OPC) ....
= OPERATING SURPLUS (PPT)......................

2. Disposal Surplus (SST)

Revenue (TRA) ....
\+ Disposal Cost Savings (SRD) ....
\- Set Up Costs (SUC).................
\- Operating Costs (OPC)..............
= DISPOSAL SURPLUS (STS)......................

3. Systems Surplus (TST)

Revenue (TRA) ....
\+ Disposal Cost Savings (SRD) ....
\+ Collection Cost Savings (SCC)......
\- Set Up Costs (SUC) ....
\- Operating Costs (OPC) ....
= SYSTEMS SURPLUS (TST) ....

Appendix F

F.2 Bulk Transport

F.2.1 Introduction

It is difficult to obtain detailed costs for each vehicle type, as many Council Departments 'hire' vehicles internally from the Council Transport Department. Table F2.1 provides an indication of the different vehicles available for the bulk transport of materials. The Journal Commercial Motor (CM) publishes a series of operating tables to help private hauliers assess their costs, and thus the rates they should charge. CM do not carry out a specific analysis for skip vehicles that are used to collect banks from sites, or for the larger skip units that can be used as storage units. However, the same analytical approach can be used to assess the operating costs of skip vehicles. Attention is focused here on the bulk transport vehicles that are used to move glass.

TABLE F2.1 Common Bulk Transport Vehicles

CHASSIS TYPE	CARRYING CAPACITY (t)	UNLADEN WEIGHT (t)	GROSS WEIGHT (t)
TIPPER	10	5	15
	16	6.6	22.5
	20	10	30
RIGID	10	5.5	15.5
	17	7	24
	20	8	28
ARTICULATED	10	4	14
	14	5	19
	16	6.5	22.5
	22	10	32.0
	25	12.4	37.4

SOURCE: Commercial Motor / Rushbrook 1984

Bulk transport vehicles are used to carry larger tonnages of glass than skip vehicles and at greater speeds. Glass recycling operators can use either Council vehicles or Private Hauliers to move recovered glass waste in bulk to the processor. Transport costs will vary with with both total distance travelled and the tonnage carried.

The survey of Local Authorities illustrated the variability in costs per tonne that they faced (Table F2.2). Stirling lies closest to the processor at a distance of 7 miles and transports the Bottle Banks direct with the use of a skip vehicle. This in effect combines uplift costs and bulk transport costs, also saves on storage costs. Eleven of the Councils transport the cullet to the processor themselves with costs varying between £1.20 to £9.71 per tonne, an average of £5.67 per tonne. Private hauliers operated on behalf of 10 of the Councils at a cost varying from £2.50 per tonne to £7.50 per tonne, an average cost of £4.72 per tonne. The private hauliers costs are slightly less than Council's operations on average.

TABLE F2.2 Bulk Transport Costs Faced By Surveyed Local Authorities

A. Council Transported:

COUNCIL CODE	DISTANCE TO THE PROCESSOR (Miles)	COST £/tonne	NUMBER OF TRIPS	COST OF BULK LOADING (£'s per tonne)
1	120	8.30	4 per month	-
26	120	7.26	1/2	1.26
30	130			
14	65	6.5	5 per year	0.5
9	58	5.60	3	-
19	58	9.71		
13	40			
28	33	4.0	1 per month	0.1
34	22	5.0		
15	12	1.2		0.66
10	14	8.0	2	-
31	7	4.0		
29		2.87	16 per year	0.58

Costs
N = 11
Mean = 5.67
S.D. = 2.56
Var = 5.97

N = 5
Mean = 0.62
S.D. = 0.417
Var = 0.139

B. Private Haulier Transported:

COUNCIL CODE	DISTANCE TO THE PROCESSOR (Miles)	COST £/tonne	NUMBER OF TRIPS	COST OF BULK LOADING (£'s per tonne)
2	130	7.50	1 per 2 mths	-
17	120	7.0	1 per 2/3 mths	
21	75	7.5		
6	60		1 per 2 mths	
11	30	3.0	4/5	
27	30	4.0	1	
32	20	2.5		
18	15	3.0		
24	12	4.0		
16		4.0		
20				

Costs
N = 9
Mean = 4.72
S.D. = 2.17
Var = 3.67

There is a marked variability amongst Councils due to non-uniform costing and the variability of distance to the processor. With private hauliers variations will be due to the distance carried, as well as whether the adoption of back haul rates has occurred.

On transport costs the Glass Manufacturers have set the 'economic' limit for a given processors catchment as 150 to 200 miles. All the Scottish schemes lie well within this limit. However, Aberdeen at 120 miles is probably at the limit of a Council operated scheme with an 8 hour return journey. Private hauliers using back haul would be able to cover a greater distance. The number of return trips reflects the generation of glass and the level of support for glass recycling.

The costs of transport are examined in terms of CM Operating Cost Tables. They have split vehicle operating costs into two elements:

1. Standing Costs - incurred throughout the life of the vehicle.
2. Running Costs - incurred when vehicle is used.

They build in 20% to cover administration costs and a further 20% to cover profit to produce an operating charge or rate.

Standing Cost comprises:

1. Vehicle Excise Duty
2. Wages
3. Rent and Rates
4. Insurance
5. Interest

To produce an annual cost these elements are totalled, and divided by 45 to produce a weekly charge. They estimate that vehicles will be off the road for an aggregate of 7 weeks to cover holidays and maintenance period.

Running Cost comprises:

1. Fuel
2. Lubricants
3. Tyres
4. Maintenance
5. Depreciation

Depreciation is calculated on a five year life based on manufacturers list prices, less cost of tyres and a 10% allowance for residual value.

They use two formulae for calculating overall vehicle operating costs:

1. For Cost Per Week = Running Costs Per Mile * Miles Per Week
   + Weekly Standing Costs

2. For Cost Per Mile = Standing Cost Per Week / Miles Run
   + Running Cost Per Mile

The rate to charge is found through either formulae plus 40% to cover administration overheads and an allowance for profits.

Vehicle costs are examined in terms of the operating tables developed by Commercial Motor (CM), work by Rushbrook (1984) and the survey undertaken of Council Operators. With glass haulage vehicles are loaded at the storage site and unloaded at the processor. Both sites will be built on hard core, so tyre damage should be similar to that of a normal private haulier. There is the possibility of tyre damage from the spillage of broken glass at either site, but this has not been reported as significant by the Councils contacted or by the manager of the processing site. In addition the removal of glass from the general waste stream may reduce tyre damage to vehicles operating to landfill sites, but this has not been quantified. It has been decided to adopt the tyre costs as used by CM as opposed to those adjusted to landfill conditions by Rushbrook. If there is significant damage to tyres from glass spillage at the storage or processing sites, the adjusted costs for tyre damage can be incorporated at a later date.

Capital charges are altered to use Local Authority rates. Most Council's assess vehicle operating costs over a life of 7 years, as opposed to 5 years adopted by private haulage companies. The Audit Commission's recent report on improving vehicle management reports life expectancy of refuse vehicles ranged from 7 years to 10 years, with 8 years being the typical replacement period. With increasing financial pressure being put on Councils some are extending the life of vehicles. This provides some short term revenue benefits against increased running costs. All three vehicle life expectancies are examined (Table 10A.5) to see what effect they have on overall operating costs.

The categories of running and standing costs have been adapted from the CM tables. Depreciation charges are incorporated under the vehicle's standing costs. As whether the vehicle is used or not capital charges will have to be met. Thus operating costs are broken up into:

1. Standing Costs:

   Vehicle Licences
   Driver Wages
   Depot Costs
   Insurance
   Capital Charges

2. Running Costs:

   Fuel
   Lubricants
   Tyres
   Maintenance

To produce an annual charge the standing costs are totalled and divided by the number of weeks the vehicle is available in a year. Private hauliers use 45 weeks to cover periods of maintenance and holidays. The Audit Commission's Report looked at the availability of Council Vehicles in a year (Table F2.3).

TABLE F2.3 Average Council Vehicle Availability - 1983
Days Off The Road Per Year

Vehicle Type	Lowest	Average	Highest
HGV up to 7.5 tonnes GVW	15	26	34
HGV over 7.5 tonnes GVW	5	29	45
Refuse Compactors	10	49	61

SOURCE: Audit Commission Improving Vehicle Management

Looking at the HGV of over 7.5 tonnes availability on average is 46 weeks, rangng from 51 weeks to 43 weeks. On the basis of the average of 46 weeks it has been decided to use 45 weeks the same availability as private vehicles.

The operating costs are assessed for the different vehicle types available. These are then examined in terms of: Length of Working Day, Turn-round Time in each return journey, Distance to Processor, Average speed of vehicle and the Payload achieved. Maximum time available for haulage varies with length of working day and turn-round times at processor and storage sites. Maximum time per day is a multiple of maximum time available and average haul speed.

F.2.2 Capital Financing

Vehicle costs are treated as capital costs that are repaid over a set period. The vehicle life is decided by local authority accounting practices. Capital costs are repaid in equal instalments over the period for which they run. Annual repayments, a, are calculated using the following equation:

$$a = \frac{PVat}{PVIFa}$$

where: PVat = Present Value of Annuity (the sum borrowed)

PVIFa = Present value of annuity, derived from financial tables with reference to the appropriate interest rate and the length of the loan

The annual capital charge incorporates two components - interest and the payment of the principal - in differing proportions each year. Table F2.4 shows an example of how the capital charge is split up into interest payments and principal payments to meet the costs of a vehicle.

TABLE F2.4 Amortisation Schedule For Vehicle Capital Costs

YEAR	CAPITAL CHARGES	INTEREST (1)	PRINCIPAL REPAYMENT (2)	REMAINING BALANCE
0	-	-	-	15671
1	4565	2194	2371	13300
2	4565	1862	2703	10597
3	4565	1484	3081	7516
4	4565	1052	3513	4003
5	4565	560	4005	-

Based on 10 tonne vehicle, with capital cost of £15671, spread over 5 years at 14% interest per annum.

(1) Interest = Balance * Interest Rate (14%)

(2) Principal Repayment = Total Instalment - Interest

Table F2.5 calculates capital charges for several different vehicle lives. Seven year figures are incorporated into the table for operating costs.

TABLE F2.5 Capital Costs And Capital Charges For Bulk Transport Vehicles

a. Capital Costs Amortised Over 7 years at 14% interest p.a. (PVIFa=4.288)

CHASSIS TYPE	TIPPERS:			RIGID:			Artics:				
CARRYING CAPACITY	10	16	20	10	17	20	10	14	16	22	25
GVW	15	22.5	30	15.5	24	28	14	19	22.5	32	37.4
CAPITAL COSTS	16931	26177	36100	15671	17524	33070	17036	20127	23218	32676	39935
CAPITAL CHARGES	3948	6104	8419	3655	4087	7712	3973	4694	5415	7620	9313
(PER WK)	88	136	187	81	91	171	88	104	120	169	207

b. Capital Costs Amortised Over 5 years at 14% interest p.a. (PVIFa=3.433)

CARRYING CAPACITY	10	16	20	10	17	20	10	14	16	22	25
CAPITAL COSTS	16931	26177	36100	15671	17524	33070	17036	20127	23218	32676	39935
CAPITAL CHARGES	4932	7625	10516	4565	5104	9633	4962	5863	6763	9518	11633
(Per Wk)	109	169	234	101	113	214	110	130	150	211	258

c. Capital Costs Amortised Over 8 years at 14% interest p.a. (PVIFa=4.638)

CARRYING CAPACITY	10	16	20	10	17	20	10	14	16	22	25
CAPITAL COSTS	16931	26177	36100	15671	17524	33070	17036	20127	23218	32676	39935
CAPITAL CHARGES	3650	5643	7782	3378	3778	7129	3672	4339	5005	7044	8609
(Per Wk)	81	125	173	75	84	158	82	96	111	157	191

Capital Costs exclude cost of tyres and a 10% residual value

CM splits Capital cost into:

Interest = Capital * Interest Rate / 45 (No of weeks)
Thus 10 tonne rigid = 15671 * .14 / 45 = 48.75

Depreciation = Value Of Vehicle/Mileage Life Of Vehiccle
Thus 10 tonne rigid = 15671/150000 =10.4

TABLE F2.6 Changes On Capital Costs With Different Vehicle Lives

Base Case: 7 year Vehicle Life, interest of 14%

CARRYING CAPACITY	10	16	20	10	17	20	10	14	16	22	25
CAPITAL CHARGES (PER WK)	88	136	187	81	91	171	88	104	120	169	207

Changes With 5 year Vehicle Life - Additions (Reductions)

CHARGES (Per Wk)	110	169	234	101	113	214	110	130	150	212	259
CHANGES (Per Wk)	22	33	47	20	22	43	22	26	30	43	52

Changes With 8 year Vehicle Life - Additions (reductions)

CHARGES (Per Wk)	81	125	173	75	84	158	82	96	111	157	191
CHANGES (Per Wk)	(7)	(11)	(14)	(6)	(7)	(13)	(6)	(8)	(9)	(12)	(16)

TABLE 10A.7 Capital Charges As A Percentage Of Operating Costs

14% 5 yrs:	22	28	32	22	22	32	23	24	26	28	29
14% 7 yrs:	17	22	25	17	18	26	19	20	21	23	24
14% 8 yrs:											

TABLE F2.8 Bulk Transport Vehicle Operating Costs

a. Standing Charges (£ Per Week):

CHASSIS TYPE	TIPPERS:			RIGID:			Artics:				
CARRYING CAPACITY	10	16	20	10	17	20	10	14	16	22	25
LICENSES	13.55	16.44	44.22	14.88	25.55	25.33	11.33	17.11	21.11	50.88	65.31
DRIVER	206.30	206.30	226.80	206.30	206.30	235.95	206.30	206.30	206.30	235.95	249.41
DEPOT COSTS	13.09	13.55	14.03	13.06	13.06	14.03	13.35	15.60	16.26	17.51	17.51
INS	23.80	32.64	36.28	23.60	32.86	35.91	23.32	32.60	32.60	61.65	69.66
CAPITAL CHARGES	88.00	136.00	187.00	81.00	91.00	171.00	88.00	104.00	120.00	169.00	207.00
TOTAL	344.74	404.90	508.30	338.84	368.77	482.22	342.30	375.61	396.27	534.99	608.89
(£/YR)	15513	18221	22874	15248	16595	21700	15404	16903	17832	24075	27400

b. Running Costs (p Per Mile):

CARRYING CAPACITY	10	16	20	10	17	20	10	14	16	22	25
FUEL	14.58	17.50	21.88	14.58	14.58	17.50	14.59	17.50	19.44	25.00	29.17
LUBRICANTS	0.53	0.57	0.57	0.53	0.54	0.57	0.53	0.53	0.54	0.54	0.63
TYRES	5.39	5.80	7.19	3.59	5.80	6.51	5.96	5.36	5.36	6.25	11.25
MAINTNCE	20.14	23.44	23.44	13.65	13.93	15.25	11.88	14.66	15.67	17.10	25.47
TOTAL (p/mile)	40.64	47.31	53.08	32.35	34.85	39.83	32.95	38.05	41.01	48.89	66.52
TOTAL (p/km)	25.4	29.56	33.17	20.23	21.78	24.89	20.59	23.78	25.63	30.56	41.57

Based On CM Tables (1983/1984)
From TABLE 10A.5 On Capital Charges (Interest + Depreciation)

CM DATA BASE:											
Fuel Cost (p/glln)	175	175	175	175	175	175	175	175	175	175	175
Miles/Glln	12	10	8	12	12	10	12	10	9	7	6
Tyre Cost	1618	2608	2877	1617	2608	3256	2680	2680	2680	3749	4499
Mileage Life Of TYres (* 10^3)	30	45	40	45	45	50	45	50	50	60	40
Mileage Life Of Vehicles (* 10^3)	150	200	200	200	200	250	200	200	240	250	250
Cost Of Vehicle	16931	26177	36100	15671	17524	33070	17036	20127	23218	32676	37039

F.2.3 Operating Costs

Standing charges are fixed irrespective of annual distance travelled by the bulk transporter. Largest expenditure is Drivers Wages, ranging from £206.30 to £249.50 per week. With capital charges this accounts for around 80% of total standing charges for all vehicle types.

Running costs are directly related to annual distance travelled with largest expenses being fuel and maintenance. These comprise 40% of the costs. For rigid and articulated trucks fuel costs are the largest fraction; whereas for tippers the maintenance costs are the largest component due to the extra hoisting mechanism.

Individual operating costs for each bulk transporter are assessed over 1 annual distance (25,000 km per year) using the standing and running costs described. On the lines of Rushbrook (1984) for each vehicle type a total operating cost model can be derived:

Tipper	10t	$y = 0.254\ X + 15513$
	16t	$y = 0.295\ X + 18221$
	20t	$y = 0.332\ X + 22874$
Rigid	10t	$y = 0.202\ X + 15248$
	17t	$y = 0.218\ X + 16595$
	20t	$y = 0.249\ X + 21700$
Artics	10t	$y = 0.206\ X + 15404$
	14t	$y = 0.238\ X + 16903$
	16t	$y = 0.256\ X + 17832$
	22t	$y = 0.306\ X + 24075$
	25t	$y = 0.416\ X + 27400$

where: y = Annual Cost (£)

X = Annual Distance (Km's)

TABLE F2.9 Comparison Of Bulk Transport Annual Operating Costs Between Vehicle Types

VEHICLE TYPE		TOTAL COST	COST/TONNE GENERAL[1]	COST/TONNE GLASS[2]	TOTAL COST (* 0.2/500)[3]	RANKING
TIPPERS	10t	21863	0.87	43.73	8.75	3
	16t	25596	1.02	51.19	10.24	7
	20t	31174	1.25	62.35	12.47	9
RIGID	10t	20298	0.81	40.60	8.12	1
	17t	22045	0.88	44.09	8.82	4
	20t	27925	1.12	55.85	11.17	8
ARTICS	10t	20554	0.82	41.11	8.22	2
	14t	22853	0.91	45.71	9.14	5
	16t	24232	0.97	48.46	9.69	6
	22t	31725	1.27	63.45	12.69	10
	25t	37800	1.51	75.60	15.12	11

1 All vehicles run 25,000 km per year and would handle about 25,000 tonnes of material per year, produces General cost per tonne.

2 Glass only figure is based on lorry operating 25,000 km per year, carrying 500 tonnes per year.

3 If glass operation is a marginal part of businesses operations, taking up 20% of lorry's time (ie 1 day per week): The Cost Per Tonne is equivalent to TOTAL COST * 0.2/500, for a 500 tonne per year operation.

Normally, Council has up to 10 tonne per week haul, so all lorry systems can cope.

TOTAL COST = Total Standing Charge
+ (Total Running Cost * Annual Distance Travelled)

TABLE F2.10 Maximum Time Available Per Return Trip For Haulage In A Working Day

Length Of Working Days (hrs):		8	8	9
Turn-round Time Per Return Trip (hrs):		1.0	0.5	1.0
No Of Return Trips Per Day	5	0.6	1.1	1.3
	4	1.0	1.5	1.3
	3	1.7	2.2	2.0
	2	3.0	3.5	3.5
	1	7.0	7.5	8.0

Calculation: Day Length (hrs) - (Trips/Day * Turn-round Time)
thus: 8 - (3 * 1) = 5 hours
5 hrs / 3 trips/day = 1.7hrs per trip

Source: Rushbrook (1984)

TABLE F2.11 Maximum Daily & Annual Haul Distance For One Return Trip And All Return Trips At Several Average Speeds

NO OF RETURN TRIPS PER DAY — DAILY DISTANCE: For 1 Return Trip (km) (For All Return TRips For Day)

NO OF RETURN TRIPS PER DAY	20 km/hr	30 km/hr	40 km/hr	50 km/hr	60 km/hr
5	12 (60)	18 (90)	24 (120)	30 (150)	36 (180)
4	20 (80)	30 (120)	40 (160)	50 (200)	60 (240)
3	34 (102)	51 (153)	68 (204)	85 (255)	102 (306)
2	60 (120)	90 (180)	120 (240)	150 (300)	180 (360)
1	140 (140)	210 (210)	280 (280)	350 (350)	420 (420)
		<131 Miles>	<175 mls>	<218 mls>	<260 mls>

Based On 8 Hour Day with 1 hour Turn-round Time per return trip

Calculation: 1.7 hour per Trip (TABLE 10A.10)* 20 km per hour
= 34 kms can be covered in one trip
For 3 trips: 34 km * 3 return trips = 102 km.

No OF RETURN RETURN TRIPS PER DAY — ANNUAL DISTANCE: For 1 Return Trip (kms) (For All Return Trips (km))

No OF RETURN TRIPS PER DAY	20 km/hr	30 km/hr	40 km/hr	50 km/hr	60 km/hr
5	3000 (15000)	4500 (22500)	6000 (30000)	7500 (37500)	9000 (45000)
4	5000 (20000)	7500 (30000)	10000 (40000)	12500 (50000)	15000 (60000)
3	8500 (25500)	12750 (38250)	17000 (51000)	21250 (63750)	25500 (76500)
2	15000 (30000)	22500 (45000)	30000 (60000)	37550 (75000)	45000 (90000)
1	35000 (35000)	52500 (52500)	70000 (70000)	87500 (87500)	105000(105000)

Assumes a 250 day working year

SOURCE: Adapted From Rushbrook (1984)

F.2.5 Comparison Between Bulk Transporter Costs

Transport cost varies with both total distance travelled and tonnage carried. The number of return trips a bulk transporter can achieve in a day would be influenced by:

1. Length of Working Day
2. Turn-round Time in each return journey
3. Distance to Processor
4. Average speed of vehicle
5. Payload achieved

Maximum time available for haulage varies with length of working day and turn-round times at processor and storage sites. Maximum time per day is a multiple of maximum time available and average haul speed. Information on Maximum Time Available (TABLE 10A.10) and Maximum Distance Per Day (TABLE F2.11) can be plotted against annual cost per trip for vehicle types to determine variations in costs with distance.

Haulage cost is dominated by standing (fixed) costs. Shown that the greater the number of trips per vehicle achieved over a given distance, the lower will be the overall cost of transport operation (Wilson 1981). Savings are achieved by carrying more refuse in fewer vehicles. For a given number of trips per day most critical factors are:

1. Ensuring that vehicles carry full payloads on each trip, &
2. Fixed costs of haulage operation.

The total cost of 1 bulk transporter per year and cost for 1 vehicle must be multiplied by fleet size to derive overall cost for entire operation. However, for glass only part of lorry costs will be assigned to the operations, depend on the extent of glass operations. Extent of costs faced by glass will depend on number of loads undertaken and number of days operated.

Bulk transport costs will be sensitive to changes in interest rate, due in part to the fraction capital charges make up the total operating costs. Operating costs are reassessed for interest rates of: 5%, 10% and 20%. As rates rise capital charges gradually become a larger proportion of total operating costs (TABLE F2.12)

F.2.6 Distance

This is a key factor as transport can make up a large proportion of the total operating costs. There is a marked variability amongst Councils due to non-uniform costing and the variability of distance. With contractors variations again will be due to distamnce but also due to the adoption of back haul rates.

On transport costs the Glass Manufacturers have set the 'economic' limit for a given processors catchment as 150 to 200 miles. All the Scottish schemes lie well within this limit. However, Aberdeen at 120 miles is probably at the limit of a Council operated scheme with an 8 hour return journey. The number of return trips reflects the generation of glass and the level of support for glass recycling.

F.2.7 Bulk Loading

This cost is minimal and in the main Councils have not separatly costed it. It is a marginal costs using existing equipment or hiring for a limited job from a contractor and can be disregarded on low level schemes. It takes about an hour to fully load 20 tonne skip. Depends if unload direct into demountable body.

TABLE F2.12 Bulk Transport Capital Charges At Selected Interest Rates And Their Incremental Effect On Total Operating Costs

CHASSIS TYPE:		TIPPER			RIGIDS			ARTICS				
CARRYING CAP:		10t	16t	20t	10t	17t	20t	10t	14t	16t	22t	25t
BASE CASE CAPITAL COSTS:		16931	27177	36100	15671	17524	33070	17036	20127	23218	32676	37039
INTEREST RATES PVIFa		CAPITAL COSTS AMORTISED OVER 5 YEARS (% OF TOTAL OPERATING COSTS) (CAPITAL/PVIFa)										
4.329	5%	3911 (17%)	6047 (22%)	8339 (25%)	3620 (17%)	4048 (17%)	7639 (26%)	3935 (18%)	4649 (19%)	5363 (21%)	7548 (22%)	8556 (21%)
3.791	10%	4466 (19%)	6905 (25%)	9523 (29%)	4134 (19%)	4623 (20%)	8723 (29%)	4494 (21%)	5309 (22%)	6124 (24%)	8619 (26%)	9770 (24%)
3.433	14%	4905 (21%)	7605 (28%)	10523 (32%)	4565 (21%)	5105 (22%)	9633 (32%)	4962 (23%)	5863 (24%)	6763 (26%)	9518 (28%)	10789 (27%)
2.991	20%	5660 (25%)	8752 (32%)	12069 (36%)	5239 (25%)	5859 (25%)	11056 (37%)	5696 (26%)	6729 (28%)	7763 (30%)	10925 (32%)	12383 (31%)
BASE CASE TOTAL OPERATING COSTS (Including Capital Charge at 14% over 5 years)		22808	27082	33209	21218	23054	29863	21558	24035	25595	33673	40121
INTEREST RATES		ADDITIONS (REDUCTIONS) TO BASE CASE TOTAL OPERATING COSTS										
	5%	(994)	(1558)	(2191)	(945)	(1057)	(1994)	(1027)	(1214)	(1400)	(1970)	(2233)
	10%	(436)	(700)	(1007)	(431)	(482)	(910)	(468)	(554)	(639)	(899)	(1019)
	14%	-	-	-	-	-	-	-	-	-	-	-
	20%	755	1147	1539	674	754	1423	734	866	1000	1407	1594

Annual Capital Charges CM 1983/84 ( )

Capital Charge Expressed As Percentage Of Total Operating Cost

Operating Costs Based On 25,000 km travel per year

SOURCE: Adapted from RUSHBROOK P E (1984)

```
C         LA GLASS RECOVERY VIABILITY MODEL
          DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
        DIMENSION SST(100,20),TST(100,20)
          DIMENSION TX(1,40),TT(100,40)
          DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
        DIMENSION TFPT(100,40),TTPT(100,40),TMPT(100,40)
        DIMENSION TFST(100,40),TTST(100,40),TMST(100,40)
        DIMENSION TFTS(100,40),TTTS(100,40),TMTS(100,40)
          COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
          COMMON /CAL2/ ID,IP,Y,C,R,KS,RV,PWLB
          COMMON /CAL3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
        COMMON /CAL4/ N,B,BC,NMD,CMD,NSP,CSP
        COMMON /CAL5/ SKA,TAR,RAI,KL,L,CPR
        COMMON /CAL6/ IYC,KA,E
          COMMON /TRA1/ TC,TQ,NV,V,IYV,U,FU,IYU
          COMMON /TRA2/ DW,NL,LC,AC
          COMMON /TRA3/ CUC
          COMMON /TRA4/ TSK,TVI,TSTC,TCUC
          COMMON /TRA5/ TSUC
          COMMON /TRA6/ TTLB,TTV,TA,TOGP,TCLR,TSTM,TROC,TTRC
          COMMON /TRA7/ TV,TM
          COMMON /TRA8/ CLAB,CLC,CNL
          COMMON /TRA9/ TTP1,TTP2,TTP3,TTP4,TTRA
          COMMON /TRA10/ CCC,CCU,UCC
          COMMON /TR1/ TFPT,TTPT,TMPT
          COMMON /TR2/ TFST,TTST,TMST
          COMMON /TR3/ TFTS,TTTS,TMTS
          COMMON /TR4/ TFSUC,TTSUC,TMSUC
          COMMON /TR5/ TSTF,IPC,TCUF,TVIF
          COMMON /TR6/ TKS,CTC,TVIM
          COMMON /TS1/ SKM,SKMPT
          COMMON /TS2/ KC,BKC,SKC
          COMMON /TS3/ H,D,CCPT
          COMMON /TS4/ BTR,TR,TL
          COMMON /TS5/ PUB,PUBPT
           COMMON /TS6/ STC
        COMMON /TS7/ TB,TD,G
          COMMON /TR7/ IC,IYT,IYS,VV,IV,F
          COMMON /TR8/ TLAB,TMLB,TMTV,TSKM,TPUB,TCMB
          COMMON /TR9/ CSS,TCSC,TCMS,TBTR
          COMMON /TR10/ TFOPC,TTOPC,TMOPC
          INTEGER W,AC
          READ(37,130)I
  130     FORMAT(I1)
C         I INPUT DECIDES PRINT OUT OPTIONS
C         0 FOR PROFITS ONLY
C         1 FOR TONNAGES AND BEP
C         2 FOR ALL PRINT OUTS
C           3 FOR TRADE ONLY
C           4 TRADE: TONNAGE, BREAKEVEN
C           5 TRADE: PROFITS, TONNAGE, BREAKEVEN
C           6 TRADE: MEETS FULL COSTS
C           7 TRADE: SHARES COSTS
C           8 TRADE: MEETS EXTRA COSTS
        READ(37,*)ID,IP
        READ(37,*)Y,C,R
        READ(37,*)N,KC,B,BC,NMD,CMD,NSP,CSP
        READ(37,*)KS,RV
        READ(37,*)IYC,IYS,PWLB
        READ(37,*)SKA,TAR,RAI,KL,L,CPR
```

```
      READ(37,*)KA,H,E,SKM,TR,TL
      READ(37,*)P1,P2,P3,P4
      READ(37,*)PCG,PGG,PAG,PMG
      READ(37,*)D
C
      READ(37,*)IC
      READ(37,*)TC,TQ
      READ(37,*)NV,V,IYV
      READ(37,*)U,FU,IYU
      READ(37,*)DW,NL,LC,AC
      READ(37,*)TM
      READ(37,*)CLC,CNL
      READ(37,*)TA
      READ(37,*)TOGP
      READ(37,*)TB,TD
      READ(37,*)G
      READ(37,*)IYT
       IF (I.EQ.0)THEN
       CALL CALCULATE
       CALL PROFITS
      ELSE IF(I.EQ.1)THEN
       CALL CALCULATE
       CALL TONNAGE
       CALL BREAKEVEN
     ELSE IF(I.EQ.2)THEN
       CALL CALCULATE
       CALL TONNAGE
       CALL BREAKEVEN
       CALL PROFITS
      ELSE IF(I.EQ.3)THEN
       CALL TRADE
       CALL TRADING
      ELSE IF(I.EQ.4)THEN
       CALL TRADE
       CALL TRADAGE
       CALL TRDBREAK
      ELSE IF(I.EQ.5)THEN
       CALL TRADE
       CALL TRADING
       CALL TRADAGE
       CALL TRDBREAK
      ELSE IF(I.EQ.6)THEN
       CALL TRADE
       CALL TRDFULL
      ELSE IF(I.EQ.7)THEN
       CALL TRADE
       CALL TRDSHARE
      ELSE IF(I.EQ.8)THEN
       CALL TRADE
       CALL TRDEXTRA
     END IF
     STOP
       END
       SUBROUTINE CALCULATE
       DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
      DIMENSION SST(100,20),TST(100,20)
       DIMENSION TX(1,40),TT(100,40)
       DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
       COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
       COMMON /CAL2/ ID,IP,Y,C,R,KS,RV,PWLB
```

```
      COMMON /CAL3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
      COMMON /CAL4/ N,B,BC,NMD,CMD,NSP,CSP
      COMMON /CAL5/ SKA,TAR,RAI,KL,L,CPR
      COMMON /CAL6/ IYC,KA,E
      COMMON /TS1/ SKM,SKMPT
      COMMON /TS2/ KC,BKC,SKC
      COMMON /TS3/ H,D,CCPT
      COMMON /TS4/ BTR,TR,TL
      COMMON /TS5/ PUB,PUBPT
      COMMON /TS6/ STC
      COMMON /TS7/ TB,TD,G
      COMMON /TR7/ IC,IYT,IYS,VV,IV,F
      COMMON /TR8/ TLAB,TMLB,TMTV,TSKM,TPUB,TCMB
      COMMON /TR9/ CSS,TCSC,TCMS,TBTR
      COMMON /TR10/ TFOPC,TTOPC,TMOPC
       INTEGER W,AC
C      P1 IS PRICE OF CLEAR GLASS POUNDS PER TONNE
C      P2 IS PRICE OF GREEN GLASS POUNDS PER TONNE
C      P3 IS PRICE OF AMBER GLASS, POUNDS PER TONNE
C      P4 IS PRICE OF MIXED GLASS, POUNDS PER TONNE
C      PGG IS PERCENTAGE OF GREEN GLASS IN TONNAGE
C      COLLECTED (DECIMALS)
C      STORE HOUSEHOLD CONTRIBUTIONS/WK FOR PRINT
       DO 99 W=1,11
       HW(1,W)=0.1+0.1*(W-1)
  99   CONTINUE
       T=5

       SIC=((SKA+TAR+RAI)+(KL))/T+CPR
      SIC=SIC*N
C      SIC = SITE COSTS
C      SKA = ADMINISTRATION COSTS
C      TAR = TARMAC BASE
C      RAI = RAILINGS
C       KL = COST OF LITTER BIN
C        L = NUMBER OF LITTER BINS
C        T = AMORTISATION PERIOD
C      CPR = CAR PARK REVENUE



       BKC=((N*KC)/IYC)*(1+((PWLB*IYC)/100))
C      N = NUMBER OF BANKS
C      BKC = COST OF BANKS
C      IYC = TIME PERIOD
C      PWLB = INTEREST RATE

       BNC=((B*BC)/IYC)*(1+((PWLB*IYC)/100))
       MOD=((NMD*CMD)/IYC)*(1+(PWLB*IYC)/100)
C      MOD = MODIFIED SKIPS
C      NMD = NUMBER OF SKIPS MODIFIED
C      CMD = COST OF MODIFICATION

       SPN=NSP*CSP
C      SPN = SPONSORSHIP

       SKC=BKC+BNC+MOD-SPN
C
       KT=(KS/IYS)*(1+((PWLB*IYS)/100))
       STC=RV+KT
```

```
C       KS = STORAGE COSTS
C       IYS = TIME PERIOD
C       PWLB = INTEREST RATE
C       RV = RATEABLE VALUE

        STC=1.0*STC
        UPC=UPC
C       UPC = UPFRONT PUBLICITY COSTS

C       CRUSHER COSTS
        CRC=(CAP/IYC)*(1+(PWLB*IYC)/100)
C       CAP = CAPITAL COSTS
C       IYC = TIME PERIOD

        SUC=SIC+SKC+STC+UPC+CRC

C       M IS % OF PARTICIPATING HSHLDS
C       W IS CODE FOR CONTRIBN/HSHLD/WEEK
C       W IS CONVERTED TO KG/HSHLD/WK
        DO 120 M=1,50
        DO 140 W=1,11
C       GLASS RECOVERED TONNAGE(GRT)

        GRT=0.052*(0.01*M*(0.1+0.1*(W-1))*ID)
        GR(M,W)=GRT

C       OPERATING COSTS
        CCPT=(H/D)
C       COLLECTION COSTS
C       SITE MAINTENANCE
        SMPT=(E/D)
C       SKIP MAINTENANCE
       TSKM=(N*SKM)
        SKMPT=TSKM/GRT
C       ADMINISTRATION
        KA=KA
        APT=KA/GRT
C       PUBLICITY COSTS
        PUB=0.01*ID
        IF(PUB.EQ.0.0) PUB=1.0
        PUBPT=PUB/GRT

C       BULK TRANSPORT
        BTR=(TR+TL)
C       STORAGE MAINTENANCE
        STM=(WS*TS)

C       CRUSHER OPERATING COSTS
        CUC=(LAB+FUEL+MAIN)
        OPC=CCPT+SMPT+SKMPT+APT+PUBPT+BTR+STM+CUC
        GOPC=OPC*GRT

C       SALES REVENUE
        TRS1=P1*PCG*GRT
        TRS2=P2*PGG*GRT
        TRS3=P3*PAG*GRT
        TRS4=P4*PMG*GRT
        TRA=TRS1+TRS2+TRS3+TRS4
C
C       SAVINGS IN REFUSE DISPOSAL COSTS(SRD)
```

```
      SRD=Y*GRT
C
C     SAVINGS IN REFUSE COLLN COSTS(SRC)
      SRC=C*0.052*(0.01*M*(0.1+0.1*(W-1))*ID)
C
      TNBC=TRA-GBKST
C
C     OPERATING PROFIT PER TONNE OF GLASS COLLECTED(PPT)
      PPT(M,W)=(TRA-GOPC-SUC)/GR(M,W)
C     SYSTEMS SURPUS (TRA + SRD)(SST)
      SST(M,W)=(TRA+SRD-GOPC-SUC)/GR(M,W)
C     TOTAL SYSTEMS SURPLUS (TST)
      TST(M,W)=(TRA+SRD+SRC-GOPC-SUC)/GR(M,W)
C     BREAK EVEN PRICE (BEP)
      BEP(M,W)=(GOPC+SUC)/GR(M,W)
C
  140 CONTINUE
  120 CONTINUE
      RETURN
      END
      SUBROUTINE TRADE
      DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
      DIMENSION SST(100,20),TST(100,20)
      DIMENSION TX(1,40),TT(100,40)
      DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
      DIMENSION TFPT(100,40),TTPT(100,40),TMPT(100,40)
      DIMENSION TFST(100,40),TTST(100,40),TMST(100,40)
      DIMENSION TFTS(100,40),TTTS(100,40),TMTS(100,40)
      COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
      COMMON /CAL2/ ID,IP,Y,C,R,KS,RV,PWLB
      COMMON /CAL3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
      COMMON /TRA1/ TC,TQ,NV,V,IYV,U,FU,IYU
      COMMON /TRA2/ DW,NL,LC,AC
      COMMON /TRA3/ CUC
      COMMON /TRA4/ TSK,TVI,TSTC,TCUC
      COMMON /TRA5/ TSUC
      COMMON /TRA6/ TTLB,TTV,TA,TOGP,TCLB,TSTM,TROC,TTRC
      COMMON /TRA7/ TV,TM
      COMMON /TRA8/ CLAB,CLC,CNL
      COMMON /TRA9/ TTP1,TTP2,TTP3,TTP4,TTRA
      COMMON /TRA10/ CCC,CCU,UCC
      COMMON /TR1/ TFPT,TTPT,TMPT
      COMMON /TR2/ TFST,TTST,TMST
      COMMON /TR3/ TFTS,TTTS,TMTS
      COMMON /TR4/ TFSUC,TTSUC,TMSUC
      COMMON /TR5/ TSTF,IPC,TCUF,TVIF
      COMMON /TR6/ TKS,CTC,TVIM
      COMMON /TS1/ SKM,SKMPT
      COMMON /TS2/ KC,BKC,SKC
      COMMON /TS3/ H,D,CCPT
      COMMON /TS4/ BTR,TR,TL
      COMMON /TS5/ PUB,PUBPT
      COMMON /TS6/ STC
      COMMON /TS7/ TB,TD,G
      COMMON /TR7/ IC,IYT,IYS,VV,IV,F
      COMMON /TR8/ TLAB,TMLB,TMTV,TSKM,TPUB,TCMB
      COMMON /TR9/ CSS,TCSC,TCMS,TBTR
      COMMON /TR10/ TFOPC,TTOPC,TMOPC
      INTEGER W,AC
C     STORE TRADE CONTRIBUTION/WK FOR PRINT
```

```
      DO 999 X=20,30
      TX(1,X)=X
  999 CONTINUE
      WRITE(32,53)KS,RV,PWLB
   53 FORMAT('0','TKS= ',I7,2X,' TRV=',F7.2,2X,'PWLB=',F7.2)
C       TRADE SYSTEM
      DO 220 Z=1,30
      DO 240 X=20,30
C       SET UP COSTS
C       SKIP COSTS
        TQ=IC*2
        TSK=((TC*TQ)/IYT)*(1+((PWLB*IYT)/100))
C       STORAGE COSTS
        KT=(KS/IYS)*(1+((PWLB*IYS)/100))
        STC=KT+RV
C       MEET FULL STORAGE COSTS (TSTF)
        TSTF=STC
C       SHARE BANK RESOURCES(TSTC)
        TSTC=0.6*STC
C       USE BOTTLE BANK RESOURCES (KTS)
        KTS=0
C       INITIAL PROMOTION COSTS (IPC)
        IPC=0
C       CRUSHER COSTS
        CCC=(U+FU/IYU)
        CCU=(1+(PWLB*IYU/100))
        UCC=CCC*CCU
        CUC=((U+FU)/IYU)*(1+((PWLB*IYU)/100))
C       MEET FULL CRUSHER COSTS (TCUF)
        TCUF=CUC
C       SHARE CRUSHER COSTS (TCUC)
        TCUC=0.6*CUC
C       USE EXISTING FACILITIES (CTC)
        CTC=0
        TRT=0.05*(0.01*X*(Z*IC))
        TT(Z,X)=TRT
C       NUMBER OF VEHICLES REQUIRED (NV)
        VV=TRT/(Z*IC)
        IF(VV.LT.1.0) GO TO 19
        IV=VV
        F=(VV-IV)
        IF(F.GE.0.5) GO TO 19
        NV=VV
        GO TO 27
   19   NV=VV+1
   27   CONTINUE
C       COLLECTION VEHICLE CHARGES
        VI=(NV*V/IYV)*(1+((PWLB*IYV)/100))
C       MEET FULL VEHICLE COSTS (TVIF)
        TVIF=VI
C       SHARE VEHICLE COSTS (TVI)
        TVI=0.2*VI
C       USE EXISTING FACILITIES (TVIM)
        TVIM=0
C       TRADE SET UP COSTS
C       TRADE SYSTEM MEETS FULL COSTS
        TFSUC=TSK+TSTF+IPC+TCUF+TVIF
C       TRADE SYSTEM SHARES BOTTLE BANK COSTS
        TTSUC=TSK+TSTC+IPC+TCUC+TVI
C       TRADE SYSTEM MEETS NEW COSTS
```

```
      TMSUC=TSK+TKS+IPC+CTC+TVIM
      TRT=0.05*(0.01*X*(Z*IC))
      TT(Z,X)=TRT
C     OPERATING COSTS
C     COLLECTION COSTS
C     LABOUR COSTS
C     MEETS FULL LABOUR COSTS
      TLAB=50*(DW+NL*LC)*(1+0.01*AC)
C     SHARES LABOUR COSTS
      TTLB=0.2*TLAB
C     MEET EXTRA LABOUR COSTS ONLY
      TMLB=0
C     VEHICLE OPERATING COSTS
C     FULL COSTS (5 DAYS)
      TV=NV*50*TM
C     SHARE VEHICLE COSTS (X DAYS)
      TTV=0.2*TV
C     MEET EXTRA COSTS ONLY
      TMTV=0
C     SKIP MAINTENANCE
      TSKM=0
C     ADMINISTRATION
      TA=0
C     ON-GOING PROMOTION
      TPUB=0
C     CRUSHER OPERATING COSTS
      COC=50*(CLC+CNL)*(1+0.01*AC)
C      MEETS FULL CRUSHER COSTS
      CLAB=COC
C     SHARES CRUSHER COSTS
      TCLB=0.2*CLAB
C     MEETS EXTRA CRUSHER COSTS
      TCMB=0
C     CRUSHER SUPPLIES & SERVICES
      CSS=CSPT*(0.05*Z*IC)
C     MEETS FULL COSTS
      CSC=CSS
C     SHARES COSTS OF SUPPLIES
      TCSC=0.2*CSS
C     SHARES EXTRA COSTS
      TCMC=0
C     STORAGE MAINTENANCE
      TSTM=0
C     BULK TRANSPORT OF TRADE GLASS
      TBTR=(TR+TL)*TRT
C     TOTAL TRADE OPERATING COSTS
C     TOTAL OPERATING COSTS MEETING FULL COSTS
      TFOPC=TLAB+TV+TSKM+TA+TPUB+CLAB+CSC+TSTM+TBTR
C     TOTAL OPERATING COSTS (SHARING COSTS)
      TTOPC=TTLB+TTV+TSKM+TA+TPUB+TCLB+TCSC+TSTM+TBTR
C     TOTAL OPERATING COSTS(MEET ONLY NEW COSTS)
      TMOPC=TMLB+TMTV+TSKM+TA+TPUB+TCMB+TCMC+TSTM+TBTR
C     INCOME
C     REVENUE
      TTP1=P1*PCG*(0.05*(0.01*X*(Z*IC)))
      TTP2=P2*(PGG)*(0.05*(0.01*X*(Z*IC)))
      TTP3=P3*PAG*(0.05*(0.01*X*(Z*IC)))
      TTP4=P4*PMG*(0.05*(0.01*X*(Z*IC)))
      TTRA=TTP1+TTP2+TTP3+TTP4
C     CHANGES IN TRADE COLLECTION COSTS
```

```
C        SAVINGS IN TRADE COLLECTION COSTS
         SCT=TB*(0.05*(0.01*X*(Z*IC)))
C        LOSS IN TRADE REVENUE
         LTR=TD*(0.05*(0.01*X*(Z*IC)))
         TCH=SCT-LTR
C        DISPOSAL SAVINGS
         TRDS=Y*(0.05*(0.01*X*(Z*IC)))
C        NET PRIVATE VIABILITY BENEFITS/COSTS
C        MEETS FULL COSTS OF OPERATIONS
         TFPT(Z,X)=(TTRA-TFOPC-TFSUC)/TT(Z,X)
C        SHARES COSTS OF OPERATIONS
         TTPT(Z,X)=(TTRA-TTOPC-TTSUC)/TT(Z,X)
C        MEETS EXTRA COSTS OF OPERATIONS
         TMPT(Z,X)=(TTRA-TMOPC-TMSUC)/TT(Z,X)
C        NET TRADE SYSTEMS SURPLUS
C        INCORPORATES DISPOSAL SAVINGS
C        MEETS FULL COSTS OF OPERATIONS
         TFST(Z,X)=(TTRA+TRDS-TFOPC-TFSUC)/TT(Z,X)
C        SHARES COSTS OF OPERATIONS
         TTST(Z,X)=(TTRA+TRDS-TTOPC-TTSUC)/TT(Z,X)
C        MEETS EXTRA COSTS OF OPERATIONS
         TMST(Z,X)=(TTRA+TRDS-TMOPC-TMSUC)/TT(Z,X)
C        TOTAL TRADE SYSTEMS SURPLUS
C        INCORPORATES COLLECTION COSTS CHANGES
C        MEETS FULL OPERATION COSTS
         TFTS(Z,X)=(TTRA+TRDS+TCH-TFOPC-TFSUC)/TT(Z,X)
C        SHARE COSTS OF OPERATIONS
         TTTS(Z,X)=(TTRA+TRDS+TCH-TTOPC-TTSUC)/TT(Z,X)
C        MEETS EXTRA COSTS OF OPERATIONS
         TMTS(Z,X)=(TTRA+TRDS+TCH-TMOPC-TMSUC)/TT(Z,X)
C        BREAKEVEN PRICES
C       BREAKEVEN PRICE FOR FULL COSTS
         BFT(Z,X)=(TFOPC+TFSUC)/TT(Z,X)
C        BREAKEVEN PRICE IF SHARES COSTS OF OPERATIONS
         BTT(Z,X)=(TTOPC+TTSUC)/TT(Z,X)
C        BREAKEVEN PRICE IF MEETS EXTRA COSTS
         BMT(Z,X)=(TMOPC+TMSUC)/TT(Z,X)
  240    CONTINUE
  220    CONTINUE
         RETURN
         END
         SUBROUTINE PROFITS
         DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
         DIMENSION SST(100,20),TST(100,20)
         DIMENSION TX(1,40),TT(100,40)
         DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
         COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
         COMMON /CAL2/ ID,IP,Y,C,R,KS,RV,PWLB
         COMMON /CAL3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
         COMMON /TRA1/ TC,TQ,NV,V,IYV,U,FU,IYU
         COMMON /TRA2/ DW,NL,LC,AC
         COMMON /TRA3/ CUC
         COMMON /TRA4/ TSK,TVI,TSTC,TCUC
         COMMON /TRA5/ TSUC
         COMMON /TRA6/ TTLB,TTV,TA,TOGP,TCLB,TSTM,TROC,TTRC
         COMMON /TRA7/ TV,TM
         COMMON /TRA8/ CLAB,CLC,CNL
         COMMON /TRA9/ TTP1,TTP2,TTP3,TTP4,TTRA
         COMMON /TRA10/ CCC,CCU,UCC
        COMMON /TR1/ TFPT,TTPT,TMPT
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      COMMON /TR2/ TFST,TTST,TMST
      COMMON /TR3/ TFTS,TTTS,TMTS
      COMMON /TR4/ TFSUC,TTSUC,TMSUC
      COMMON /TR5/ TSTF,IPC,TCUF,TVIF
      COMMON /TR6/ TKS,CTC,TVIM
      COMMON /TS1/ SKM,SKMPT
       INTEGER W,AC
      COMMON /TS2/ KC,BKC,SKC
      COMMON /TS3/ H,D,CCPT
      COMMON /TS4/ BTR,TR,TL
      COMMON /TS5/ PUB,PUBPT
      COMMON /TS6/ STC
      COMMON /TS7/ TB,TD,G
C
C       PRINT OUT OF OPERATING PROFITS OR LOSS
        WRITE(32,500)
  500   FORMAT(' ','LA GLASS RECOVERY VIABILITY MODEL')
        WRITE(32,600)
  600   FORMAT(' ','PROFIT/LOSS / TONNE WASTE GLASS')
        WRITE(32,700)P1
  700   FORMAT(' ','PRICE OF CLEAR GLASS PER TONNE  =', F7.2)
        WRITE(32,800)P2
  800   FORMAT(' ','PRICE OF GREEN GLASS PER TONNE  =',F7.2)
        WRITE(32,900)
  900   FORMAT('  ')
        WRITE(32,1000)
 1000   FORMAT(' ','GLASS PER DOM PREM PER WK(KG)')
        WRITE(32,1100)(HW(1,W),W=1,11)
 1100   FORMAT(' ',6X,11F9.1)
        WRITE(32,1200)
 1200   FORMAT(' ','PERCENTAGE')
        WRITE(32,1300)
 1300   FORMAT(' ','OF')
        WRITE(32,1400)
 1400   FORMAT(' ','PARTICIPATION')
        DO 60 M=1,50
        WRITE(32,1500)M
 1500   FORMAT('0',I3)
        WRITE(32,1600)(PPT(M,W),W=1,11)
 1600   FORMAT('+',6X,11F9.2)
   60   CONTINUE
C
C       PRINT OUT OF SYSTEMS SURPLUS
        WRITE(32,1640)
 1640   FORMAT('0','SYSTEMS SURPLUS')
        WRITE(32,1690)
 1690   FORMAT(' ','GLASS PER DOM PREM PER WK (KG)')
        WRITE(32,1700)(HW(1,W),W=1,11)
 1700   FORMAT(' ',6X,11F9.1)
       WRITE(32,1710)
 1710  FORMAT(' ','PERCENTAGE')
       WRITE(32,1720)
 1720  FORMAT(' ','OF')
       WRITE(32,1730)
 1730  FORMAT(' ','PARTICIPATION')
        DO 70 M=1,50
        WRITE(32,1800)M
 1800   FORMAT('0',I3)
        WRITE(32,1900)(SST(M,W),W=1,11)
 1900   FORMAT('+',6X,11F9.2)
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```
   70  CONTINUE
C
C      PRINTOUT OF TOTALSURPLUS
       WRITE(32,1905)
 1905  FORMAT('0','TOTAL SYSTEMS SURPLUS')
       WRITE(32,1910)
 1910  FORMAT(' ','GLASS PER PREM PER WK (KG)')
       WRITE(32,1920)(HW(1,W),W=1,11)
 1920  FORMAT(' ',6X,11F9.1)
      WRITE(32,1922)
 1922 FORMAT(' ','PERCENTAGE')
      WRITE(32,1924)
 1924 FORMAT(' ','OF')
      WRITE(32,1926)
 1926 FORMAT(' ','PARTICIPATION')
       DO 75 M=1,50
       WRITE(32,1930)M
 1930  FORMAT('0',I3)
       WRITE(32,1940)(TST(M,W),W=1,11)
 1940  FORMAT('+',6X,11F9.2)
   75  CONTINUE
         RETURN
       END
       SUBROUTINE TRADING
       DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
       DIMENSION SST(100,20),TST(100,20)
       DIMENSION TX(1,40),TT(100,40)
       DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
       DIMENSION TFPT(100,40),TTPT(100,40),TMPT(100,40)
       DIMENSION TFST(100,40),TTST(100,40),TMST(100,40)
       DIMENSION TFTS(100,40),TTTS(100,40),TMTS(100,40)
       COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
       COMMON /CAL2/ ID,IP,Y,C,R,KS,RV,PWLB
       COMMON /CAL3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
       COMMON /TRA1/ TC,TQ,NV,V,IYV,U,FU,IYU
       COMMON /TRA2/ DW,NL,LC,AC
       COMMON /TRA3/ CUC
       COMMON /TRA4/ TSK,TVI,TSTC,TCUC
       COMMON /TRA5/ TSUC
       COMMON /TRA6/ TTLB,TTV,TA,TOGP,TCLB,TSTM,TROC,TTRC
       COMMON /TRA7/ TV,TM
       COMMON /TRA8/ CLAB,CLC,CNL
       COMMON /TRA9/ TTP1,TTP2,TTP3,TTP4,TTRA
       COMMON /TRA10/ CCC,CCU,UCC
       COMMON /TR1/ TFPT,TTPT,TMPT
       COMMON /TR2/ TFST,TTST,TMST
       COMMON /TR3/ TFTS,TTTS,TMTS
       COMMON /TR4/ TFSUC,TTSUC,TMSUC
       COMMON /TR5/ TSTF,IPC,TCUF,TVIF
       COMMON /TR6/ TKS,CTC,TVIM
       COMMON /TS1/ SKM,SKMPT
       INTEGER W,AC
C      PRINT OUT OF TRADE
       WRITE(32,5000)
 5000  FORMAT(' ','TRADE RETURNS')
       WRITE(32,5100)
 5100  FORMAT(' ','GLASS PER TRADE PREM PER WK (KG)')
       WRITE(32,5200)(TX(1,X),X=20,30)
 5200  FORMAT(' ',6X,11F10.1)
      WRITE(32,5210)
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5210  FORMAT(' ','PERCENTAGE')
      WRITE(32,5220)
5220  FORMAT(' ','OF')
      WRITE(32,5230)
5230  FORMAT(' ','PARTICIPATION')
       DO 77 Z=1,30
       WRITE(32,5300)Z
5300   FORMAT('0',F3.0)
       WRITE(32,5400)(TFPT(Z,X),X=20,30)
5400   FORMAT('+',6X,11F10.2)
  77   CONTINUE
      WRITE(32,7000)
7000  FORMAT(' ','TRADE RETURNS')
      WRITE(32,7100)
7100  FORMAT(' ','SHARES OPERATING COSTS')
      WRITE(32,7200)
7200  FORMAT(' ','GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,7300)(TX(1,X),X=20,30)
7300  FORMAT(' ',6X,11F10.1)
      WRITE(32,7310)
7310  FORMAT(' ','PERCENTAGE')
      WRITE(32,7320)
7320  FORMAT(' ','OF')
      WRITE(32,7330)
7330  FORMAT(' ','PARTICIPATION')
      DO 83 Z=1,30
      WRITE(32,7400)Z
7400  FORMAT('0',F3.0)
      WRITE(32,7500)(TTPT(Z,X),X=20,30)
7500  FORMAT('+',6X,11F10.2)
  83  CONTINUE
      WRITE(32,7600)
7600  FORMAT(' ','TRADE RETURNS')
      WRITE(32,7700)
7700  FORMAT(' ','TRADE SYSTEM MEETS EXTRA COSTS')
      WRITE(32,7800)
7800  FORMAT(' ','GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,7900)(TX(1,X),X=20,30)
7900  FORMAT(' ',6X,11F10.1)
      WRITE(32,7910)
7910  FORMAT(' ','PERCENTAGE')
      WRITE(32,7920)
7920  FORMAT(' ','OF')
      WRITE(32,7930)
7930  FORMAT(' ','PARTICIPATION')
      DO 85 Z=1,30
      WRITE(32,8000)Z
8000  FORMAT('0',F3.0)
      WRITE(32,8100)(TMPT(Z,X),X=20,30)
8100  FORMAT('+',6X,11F10.2)
  85  CONTINUE
       RETURN
       END
C
C      SUBROUTINE TRADE MEETS FULL COSTS (TRDFULL)
       SUBROUTINE TRDFULL
       DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
       DIMENSION SST(100,20),TST(100,20)
       DIMENSION TX(1,40),TT(100,40)
       DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
```

```
      DIMENSION TFPT(100,40),TTPT(100,40),TMPT(100,40)
      DIMENSION TFST(100,40),TTST(100,40),TMST(100,40)
      DIMENSION TFTS(100,40),TTTS(100,40),TMTS(100,40)
      COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
      COMMON /CAL3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
      COMMON /TR1/ TFPT,TTPT,TMPT
      COMMON /TR2/ TFST,TTST,TMST
      COMMON /TR3/ TFTS,TTTS,TMTS
      WRITE(32,6200)
 6200 FORMAT('0','TRADE RETURNS')
      WRITE(32,6210)
 6210 FORMAT('0','MEETS FULL COSTS OF TRADE OPERATIONS')
      WRITE(32,6220)
 6220 FORMAT('0','PRIVATE VIABILITY (TFPT)')
      WRITE(32,6230)
 6230 FORMAT('0','            GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6240)(TX(1,X),X=20,30)
 6240 FORMAT('0',6X,11F10.2)
       WRITE(32,6242)
 6242  FORMAT(' ','PERCENTAGE')
       WRITE(32,6244)
 6244  FORMAT(' ','OF')
       WRITE(32,6246)
 6246  FORMAT(' ','PARTICIPATION')
      DO 91 Z=1,30
      WRITE(32,6250)Z
 6250 FORMAT('0',F4.0)
      WRITE(32,6260)(TFPT(Z,X),X=20,30)
 6260 FORMAT('+',6X,11F10.2)
   91 CONTINUE
      WRITE(32,6270)
 6270 FORMAT('0','  ')
      WRITE(32,6280)
 6280 FORMAT('0','DISPOSAL SYSTEMS SURPLUS (TFST)')
      WRITE(32,6290)
 6290 FORMAT('0','            GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6300)(TX(1,X),X=20,30)
 6300 FORMAT('0',6X,11F10.2)
      WRITE(32,6302)
 6302 FORMAT(' ','PERCENTAGE')
      WRITE(32,6304)
 6304 FORMAT(' ','OF')
      WRITE(32,6306)
 6306 FORMAT(' ','PARTICIPATION')
      DO 93 Z=1,30
      WRITE(32,6310)Z
 6310 FORMAT('0',F4.0)
      WRITE(32,6320)(TFST(Z,X),X=20,30)
 6320 FORMAT('+',6X,11F10.2)
   93 CONTINUE
      WRITE(32,6330)
 6330 FORMAT('0','  ')
      WRITE(32,6340)
 6340 FORMAT('0','TOTAL SYSTEMS SURPLUS (TFTS)')
      WRITE(32,6350)
 6350 FORMAT('0','            GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6360)(TX(1,X),X=20,30)
 6360 FORMAT('0',6X,11F10.2)
      WRITE(32,6362)
 6362 FORMAT(' ','PERCENTAGE')
```

```
      WRITE(32,6364)
 6364 FORMAT(' ','OF')
      WRITE(32,6366)
 6366 FORMAT(' ','PARTICIPATION')
      DO 95 Z=1,30
      WRITE(32,6365)Z
 6365 FORMAT(' ',F4.0)
      WRITE(32,6370)(TFTS(Z,X),X=20,30)
 6370 FORMAT('+',6X,11F10.2)
   95 CONTINUE
       RETURN
       END
C
C     SUBROUTINE SHARING COSTS (TRDSHARE)
      SUBROUTINE TRDSHARE
      DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
      DIMENSION SST(100,20),TST(100,20)
      DIMENSION TX(1,40),TT(100,40)
      DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
      DIMENSION TFPT(100,40),TTPT(100,40),TMPT(100,40)
      DIMENSION TFST(100,40),TTST(100,40),TMST(100,40)
      DIMENSION TFTS(100,40),TTTS(100,40),TMTS(100,40)
      COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
      COMMON /CAL3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
      COMMON /TR1/ TFPT,TTPT,TMPT
      COMMON /TR2/ TFST,TTST,TMST
      COMMON /TR3/ TFTS,TTTS,TMTS
      WRITE(32,6400)
 6400 FORMAT('0',' ')
       WRITE(32,6402)
 6402  FORMAT(' ','TRADE RETURNS')
      WRITE(32,6410)
 6410 FORMAT('0','SHARES COSTS OF TRADE OPERATIONS')
      WRITE(32,6420)
 6420 FORMAT('0','PRIVATE VIABILITY (TTPT)')
      WRITE(32,6430)
 6430 FORMAT('0','                GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6440)(TX(1,X),X=20,30)
 6440 FORMAT(' ',6X,11F10.2)
      WRITE(32,6442)
 6442 FORMAT(' ','PERCENTAGE')
      WRITE(32,6444)
 6444 FORMAT(' ','OF')
      WRITE(32,6446)
 6446 FORMAT(' ','PARTICIPATION')
      DO 97 Z=1,30
      WRITE(32,6450)Z
 6450 FORMAT(' ',F4.0)
      WRITE(32,6460)(TTPT(Z,X),X=20,30)
 6460 FORMAT('+',6X,11F10.2)
   97 CONTINUE
      WRITE(32,6470)
 6470 FORMAT('0','  ')
      WRITE(32,6480)
 6480 FORMAT('0','DISPOSAL SYSTEMS SURPLUS (TTST)')
      WRITE(32,6490)
 6490 FORMAT('0','               GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6500)(TX(1,X),X=20,30)
 6500 FORMAT('0',6X,11F10.2)
      WRITE(32,6502)
```

```
6502  FORMAT(' ','PERCENTAGE')
      WRITE(32,6504)
6504  FORMAT(' ','OF')
      WRITE(32,6506)
6506  FORMAT(' ','PARTICIPATION')
      DO 99 Z=1,30
      WRITE(32,6510)Z
6510  FORMAT(' ',F4.0)
      WRITE(32,6520)(TTST(Z,X),X=20,30)
6520  FORMAT('+',6X,11F10.2)
  99  CONTINUE
      WRITE(32,6530)
6530  FORMAT('0',' ')
      WRITE(32,6540)
6540  FORMAT('0','TOTAL SYSTEMS SURPLUS (TTTS)')
      WRITE(32,6560)
6560  FORMAT('0',10X,'GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6570)(TX(1,X),X=20,30)
6570  FORMAT('0',6X,11F10.2)
      WRITE(32,6572)
6572  FORMAT(' ','PERCENTAGE')
      WRITE(32,6574)
6574  FORMAT(' ','OF')
      WRITE(32,6576)
6576  FORMAT(' ','PARTICIPATION')
      DO 101 Z=1,30
      WRITE(32,6580)Z
6580  FORMAT(' ',F4.0)
      WRITE(32,6590)(TTTS(Z,X),X=20,30)
6590  FORMAT('+',6X,11F10.2)
 101  CONTINUE
      RETURN
      END
C
      SUBROUTINE TRDEXTRA
      DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
      DIMENSION SST(100,20),TST(100,20)
      DIMENSION TX(1,40),TT(100,40)
      DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
      DIMENSION TFPT(100,40),TTPT(100,40),TMPT(100,40)
      DIMENSION TFST(100,40),TTST(100,40),TMST(100,40)
      DIMENSION TFTS(100,40),TTTS(100,40),TMTS(100,40)
      COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
      COMMON /CAL3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
      COMMON /TR1/ TFPT,TTPT,TMPT
      COMMON /TR2/ TFST,TTST,TMST
      COMMON /TR3/ TFTS,TTTS,TMTS
      WRITE(32,6600)
6600  FORMAT('0',' ')
      WRITE(32,6602)
6602  FORMAT('0','TRADE RETURNS')
      WRITE(32,6610)
6610  FORMAT('0','EXTRA COSTS MET BY TRADE OPERATIONS')
      WRITE(32,6620)
6620  FORMAT('0','PRIVATE VIABILITY (TMPT)')
      WRITE(32,6630)
6630  FORMAT('0',10X,'GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6640)(TX(1,X),X=20,30)
6640  FORMAT('0',6X,11F10.2)
      WRITE(32,6642)
```

```
6642  FORMAT(' ','PERCENTAGE')
      WRITE(32,6644)
6644  FORMAT(' ','OF')
      WRITE(32,6646)
6646  FORMAT(' ','PARTICIPATION')
      DO 103 Z=1,30
      WRITE(32,6650)Z
6650  FORMAT(' ',F4.0)
      WRITE(32,6660)(TMPT(Z,X),X=20,30)
6660  FORMAT('+',6X,11F10.2)
 103  CONTINUE
      WRITE(32,6670)
6670  FORMAT('0',' ')
      WRITE(32,6680)
6680  FORMAT('0','DISPOSAL SYSTEMS SURPLUS')
      WRITE(32,6690)
6690  FORMAT('0',10X,'GLASS PER TRADE PREMISES PER WEEK')
      WRITE(32,6700)(TX(1,X),X=20,30)
6700  FORMAT('0',6X,11F10.2)
      WRITE(32,6702)
6702  FORMAT(' ','PERCENTAGE')
      WRITE(32,6704)
6704  FORMAT(' ','OF')
      WRITE(32,6706)
6706  FORMAT(' ','PARTICIPATION')
      DO 105 Z=1,30
      WRITE(32,6710)Z
6710  FORMAT(' ',F4.0)
      WRITE(32,6720)(TMST(Z,X),X=20,30)
6720  FORMAT('+',6X,11F10.2)
 105  CONTINUE
      WRITE(32,6730)
6730  FORMAT('0',' ')
      WRITE(32,6740)
6740  FORMAT('0','TOTAL SYSTEMS SURPLUS (TMTS)')
      WRITE(32,6750)
6750  FORMAT('0',10X,'GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6760)(TX(1,X),X=20,30)
6760  FORMAT('0',6X,11F10.2)
      WRITE(32,6762)
6762  FORMAT(' ','PERCENTAGE')
      WRITE(32,6764)
6764  FORMAT(' ','OF')
      WRITE(32,6766)
6766  FORMAT(' ','PARTICIPATION')
      DO 107 Z=1,30
      WRITE(32,6770)Z
6770  FORMAT(' ',F4.0)
      WRITE(32,6780)(TMTS(Z,X),X=20,30)
6780  FORMAT('+',6X,11F10.2)
 107  CONTINUE
      RETURN
      END
C
C
       SUBROUTINE BREAKEVEN
       DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
       COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
       INTEGER W,AC
C      PRINT OUT OF BREAKEVEN PRICES
```

```
C
C
      WRITE(32,2000)
 2000 FORMAT(' ','BREAKEVEN PRICES FOR DIFFERENT TONNAGES')
      WRITE(32,2100)
 2100 FORMAT(' ')
      WRITE(32,2200)
 2200 FORMAT(' ','GLASS PER PREM PER WK (KG)')
      WRITE(32,2300)(HW(1,W),W=1,11)
 2300 FORMAT(' ',6X,11F7.1)
      WRITE(32,2400)
 2400 FORMAT(' ','PERCENTAGE')
      WRITE(32,2500)
 2500 FORMAT(' ','OF')
      WRITE(32,2600)
 2600 FORMAT(' ','PARTICIPATION')
C
      DO 80 M=1,50
      WRITE(32,2700)M
 2700 FORMAT('0',I3)
      WRITE(32,2800)(BEP(M,W),W=1,11)
 2800 FORMAT('+',6X,11F7.1)
   80 CONTINUE
C
      RETURN
      END
C
      SUBROUTINE TRDBREAK
      DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
      DIMENSION SST(100,20),TST(100,20)
      DIMENSION TX(1,40),TT(100,40)
      DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
      COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
      COMMON /CAL3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
C     PRINT OUT OF BREAKEVEN PRICES FOR TRADE SCHEMES
      WRITE(32,6600)
 6600 FORMAT('0','BREAKEVEN PRICES FOR TRADE SCHEMES')
      WRITE(32,6610)
 6610 FORMAT('0','TRADE SCHEME MEETS FULL COSTS ')
      WRITE(32,6620)
 6620 FORMAT('0',12X,'GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6630)(TX(1,X),X=20,30)
 6630 FORMAT('0',6X,11F10.2)
      WRITE(32,6640)
 6640 FORMAT(' ','PERCENTAGE')
      WRITE(32,6650)
 6650 FORMAT(' ','OF')
      WRITE(32,6660)
 6660 FORMAT(' ','PARTICIPATION')
      DO 109 Z=1,30
      WRITE(32,6670)Z
 6670 FORMAT(' ',F4.0)
      WRITE(32,6680)(BFT(Z,X),X=20,30)
 6680 FORMAT('+',6X,11F10.2)
  109 CONTINUE
      WRITE(32,6690)
 6690 FORMAT('0',' ')
      WRITE(32,6700)
 6700 FORMAT('0','TRADE SCHEME SHARES COSTS OF SCHEME')
      WRITE(32,6710)
```

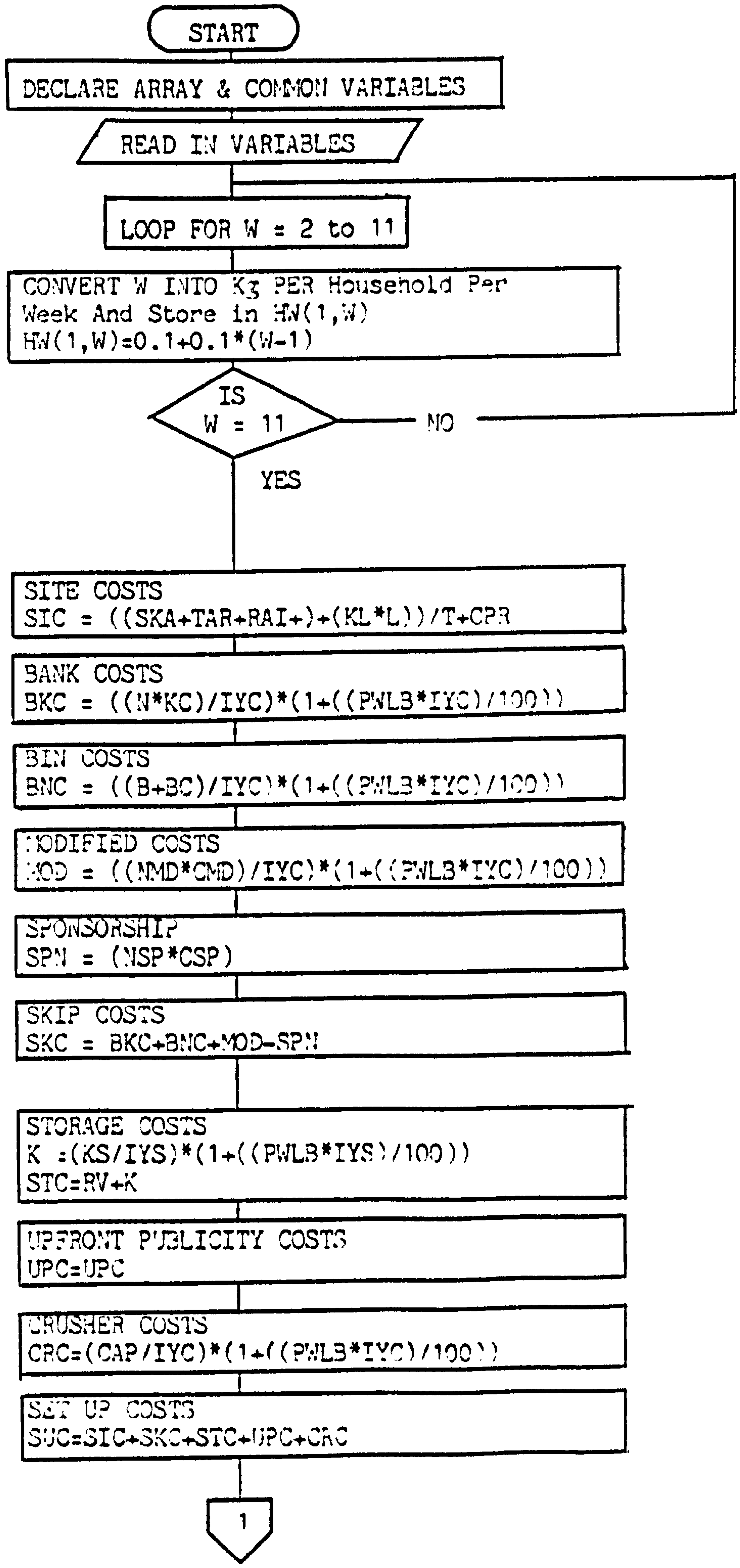
```
 6710  FORMAT('0',12X,'GLASS PER TRADE PREMISE PER WEEK (KG)')
       WRITE(32,6720)(TX(1,X),X=20,30)
 6720  FORMAT('0',6X,11F10.2)
       WRITE(32,6730)
 6730  FORMAT(' ','PERCENTAGE')
       WRITE(32,6740)
 6740  FORMAT(' ','OF')
       WRITE(32,6750)
 6750  FORMAT(' ','PARTICIPATION')
       DO 111 Z=1,30
       WRITE(32,6760)Z
 6760  FORMAT(' ',F4.0)
       WRITE(32,6770)(BTT(Z,X),X=20,30)
 6770  FORMAT('+',6X,11F10.2)
  111  CONTINUE
       WRITE(32,6780)
 6780  FORMAT('0',' ')
C
C       TRADE SCHEME MEETS EXTRA COSTS INCURRED
       WRITE(32,6800)
 6800  FORMAT('0','TRADE SCHEME MEETS EXTRA COSTS INCURRED')
       WRITE(32,6810)
 6810  FORMAT('0',12X,'GLASS PER TRADE PREMISES PER WEEK')
       WRITE(32,6820)(TX(1,X),X=20,30)
 6820  FORMAT('0',6X,11F10.2)
       WRITE(32,6830)
 6830  FORMAT(' ','PERCENTAGE')
       WRITE(32,6840)
 6840  FORMAT(' ','OF')
       WRITE(32,6850)
 6850  FORMAT(' ','PARTICIPATION')
       DO 115 Z=1,30
       WRITE(32,6860)Z
 6860  FORMAT(' ',F4.0)
       WRITE(32,6870)(BMT(Z,X),X=20,30)
 6870  FORMAT('+',6X,11F10.2)
  115  CONTINUE
       RETURN
       END
C
        SUBROUTINE TONNAGE
        DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
        COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
        INTEGER W,AC
C
C       PRINT OUT OF TONNAGES COLLECTED
C
        WRITE(32,3000)
 3000   FORMAT(' ','TONNES OF WASTE GLASS RECOVERED / YR')
        WRITE(32,3100)
 3100   FORMAT('  ')
        WRITE(32,3200)
 3200   FORMAT(' ','GLASS PER DOM PREM PER WEEK (KG)')
        WRITE(32,3300)(HW(1,W),W=1,11)
 3300   FORMAT(' ',6X,11F7.1)
        WRITE(32,3400)
 3400   FORMAT(' ','PERCENTAGE')
        WRITE(32,3500)
 3500   FORMAT(' ','OF')
        WRITE(32,3600)
```

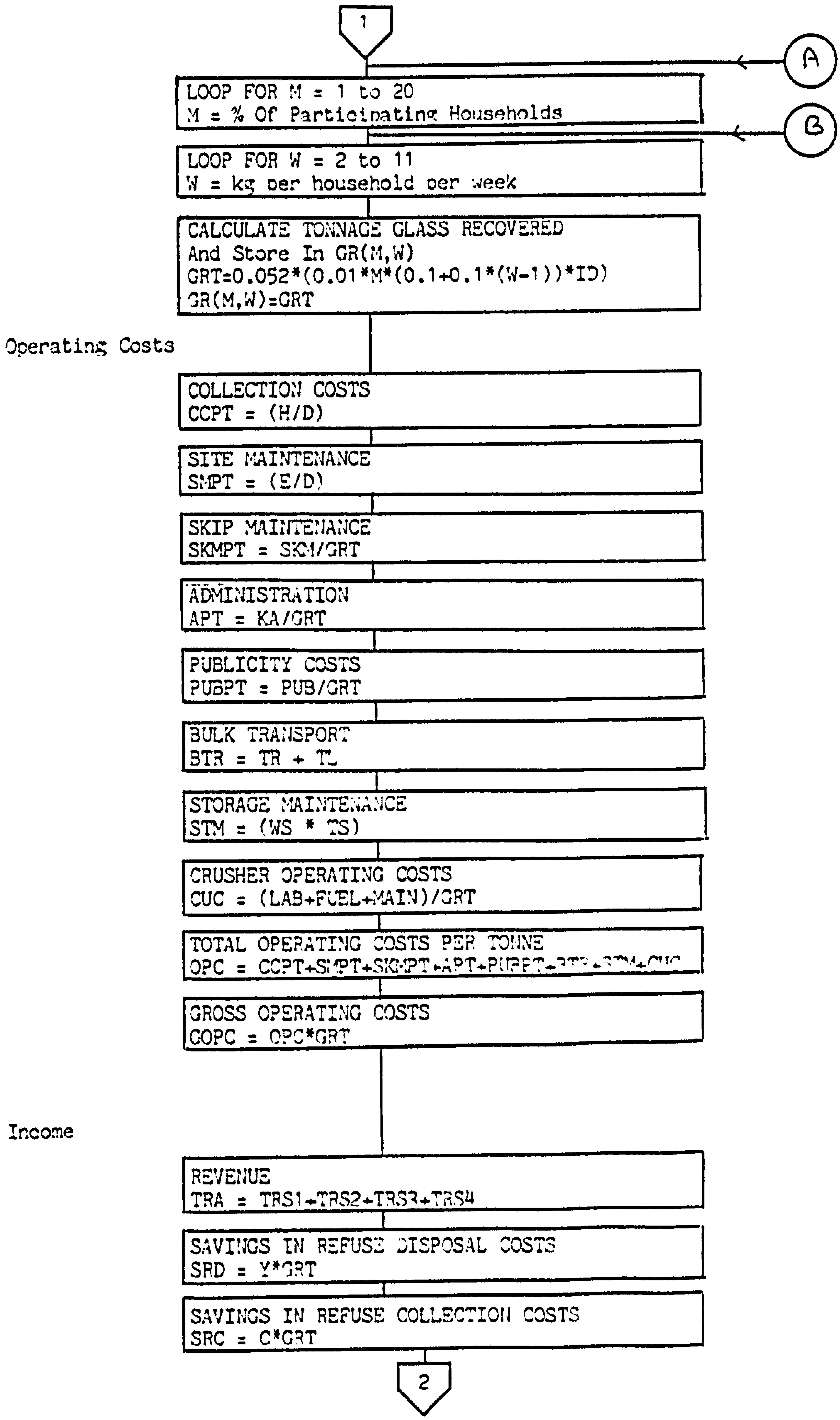
```
3600  FORMAT(' ','PARTICIPATION')
C
      DO 90 M=1,50
      WRITE(32,3700)M
3700  FORMAT('0',I3)
      WRITE(32,3800)(GR(M,W),W=1,11)
3800  FORMAT('+',6X,11F7.1)


  90  CONTINUE
C
      RETURN
      END
C
      SUBROUTINE TRADAGE
      DIMENSION PPT(100,20),BEP(100,20),HW(1,20),GR(100,20)
      DIMENSION SST(100,20),TST(100,20)
      DIMENSION TX(1,40),TT(100,40)
      DIMENSION TRP(100,20),BFT(100,40),BTT(100,40),BMT(100,40)
      DIMENSION TFPT(100,40),TTPT(100,40),TMPT(100,40)
      DIMENSION TFST(100,40),TTST(100,40),TMST(100,40)
      DIMENSION TFTS(100,40),TTTS(100,40),TMTS(100,40)
      COMMON /CAL1/ PPT,BEP,HW,GR,SST,TST,TX,TT,TRP,BFT,BTT,BMT,TRT
      INTEGER W,AC
C     PRINT OUT OF TRADE TONNAGE COLLECTED
      WRITE(32,6010)
6010  FORMAT('0','TONNES OF TRADE WASTE GLASS RECOVERED PER YEAR')
      WRITE(32,6020)
6020  FORMAT(' ','GLASS PER TRADE PREMISES PER WEEK (KG)')
      WRITE(32,6030)(TX(1,X),X=20,30)
6030  FORMAT(' ',6X,11F9.2)
      WRITE(32,6040)
6040  FORMAT(' ','PERCENTAGE')
      WRITE(32,6050)
6050  FORMAT(' ','OF')
      WRITE(32,6060)
6060  FORMAT(' ','PARTICIPATION')
      DO 43 Z=1,30
      WRITE(32,6070)Z
6070  FORMAT('0',F4.1)
      WRITE(32,6080)(TT(Z,X),X=20,30)
6080  FORMAT('+',6X,11F9.2)
  43  CONTINUE
      RETURN
      END
```

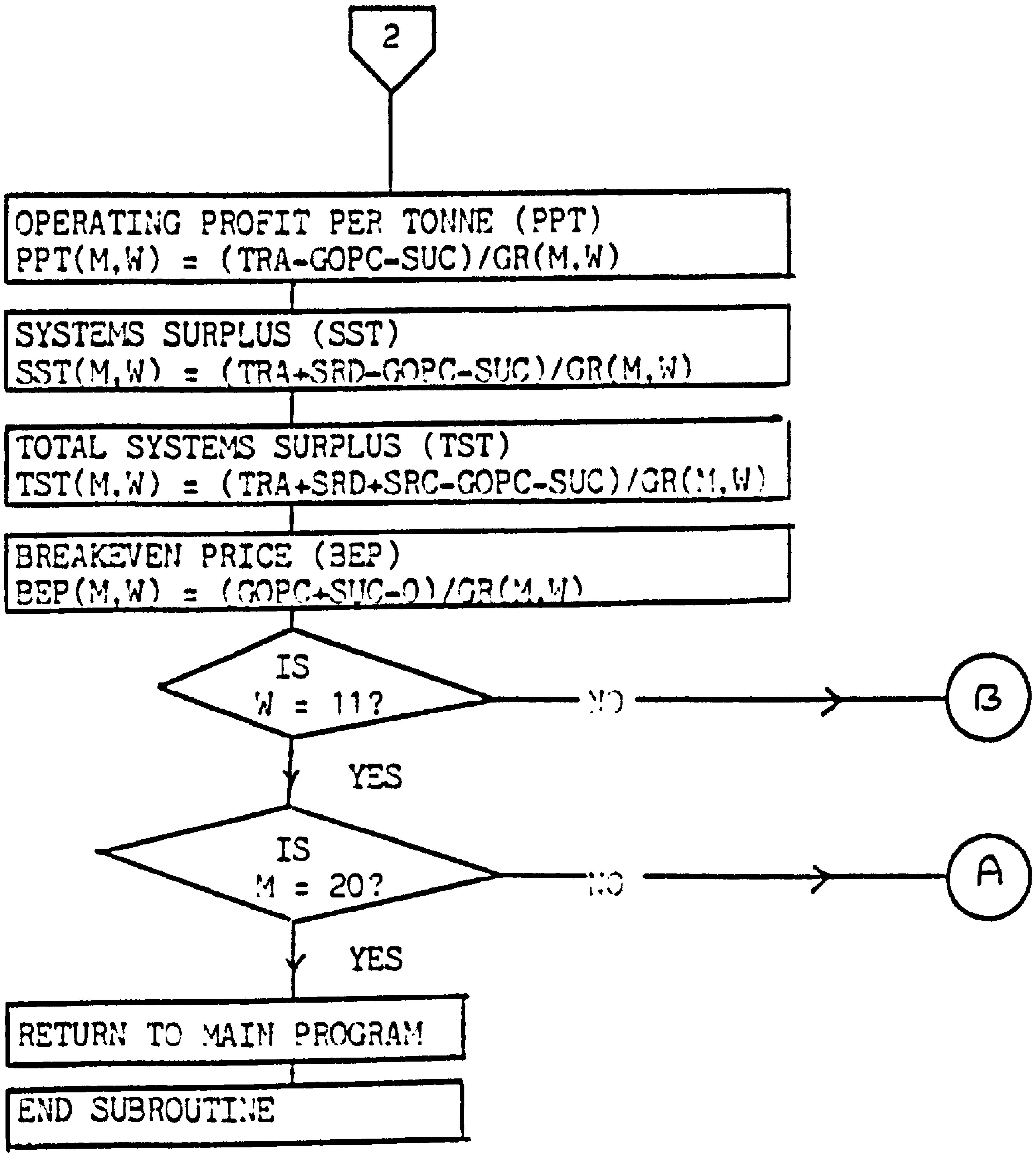
SUBROUTINE CALCULATE

Set Up Costs

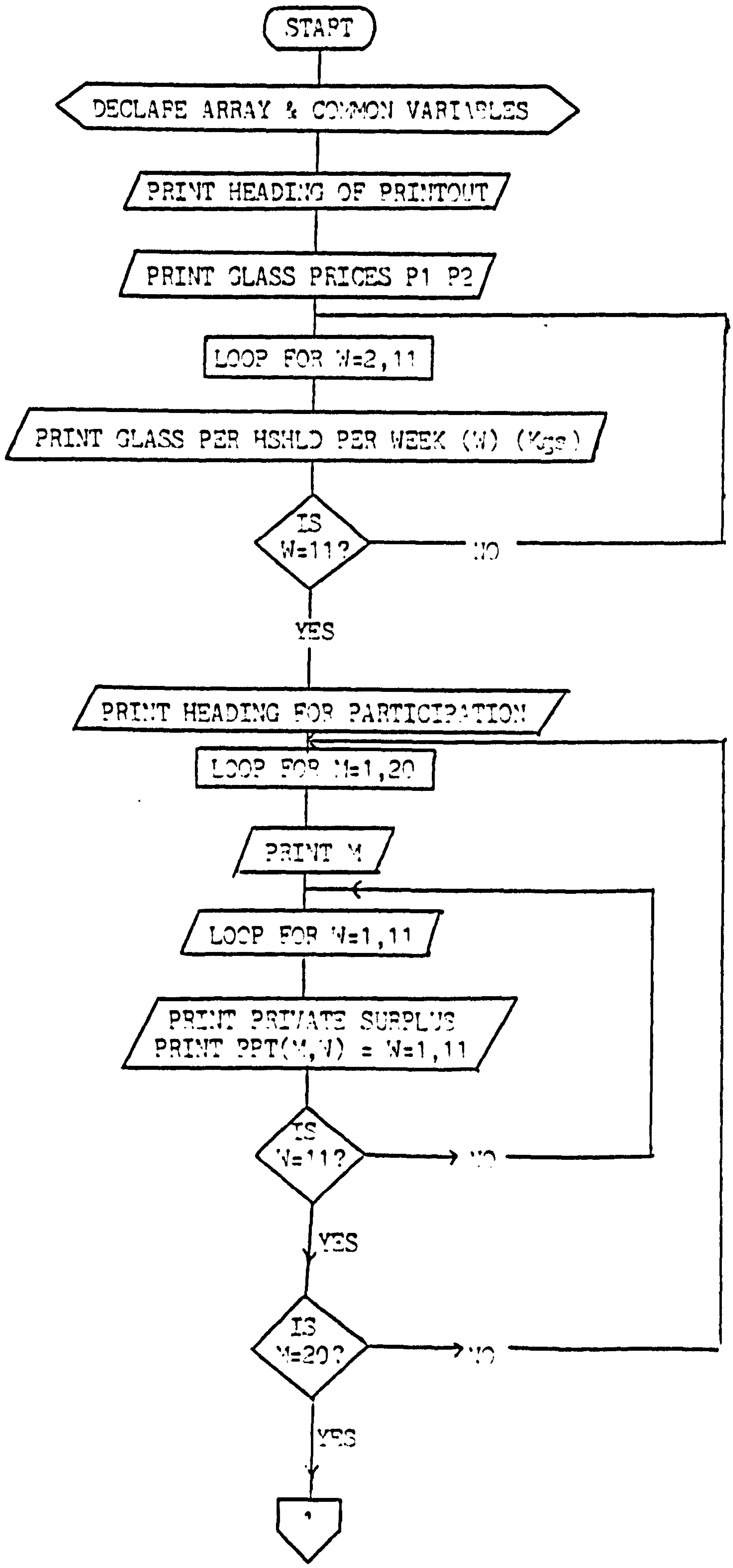


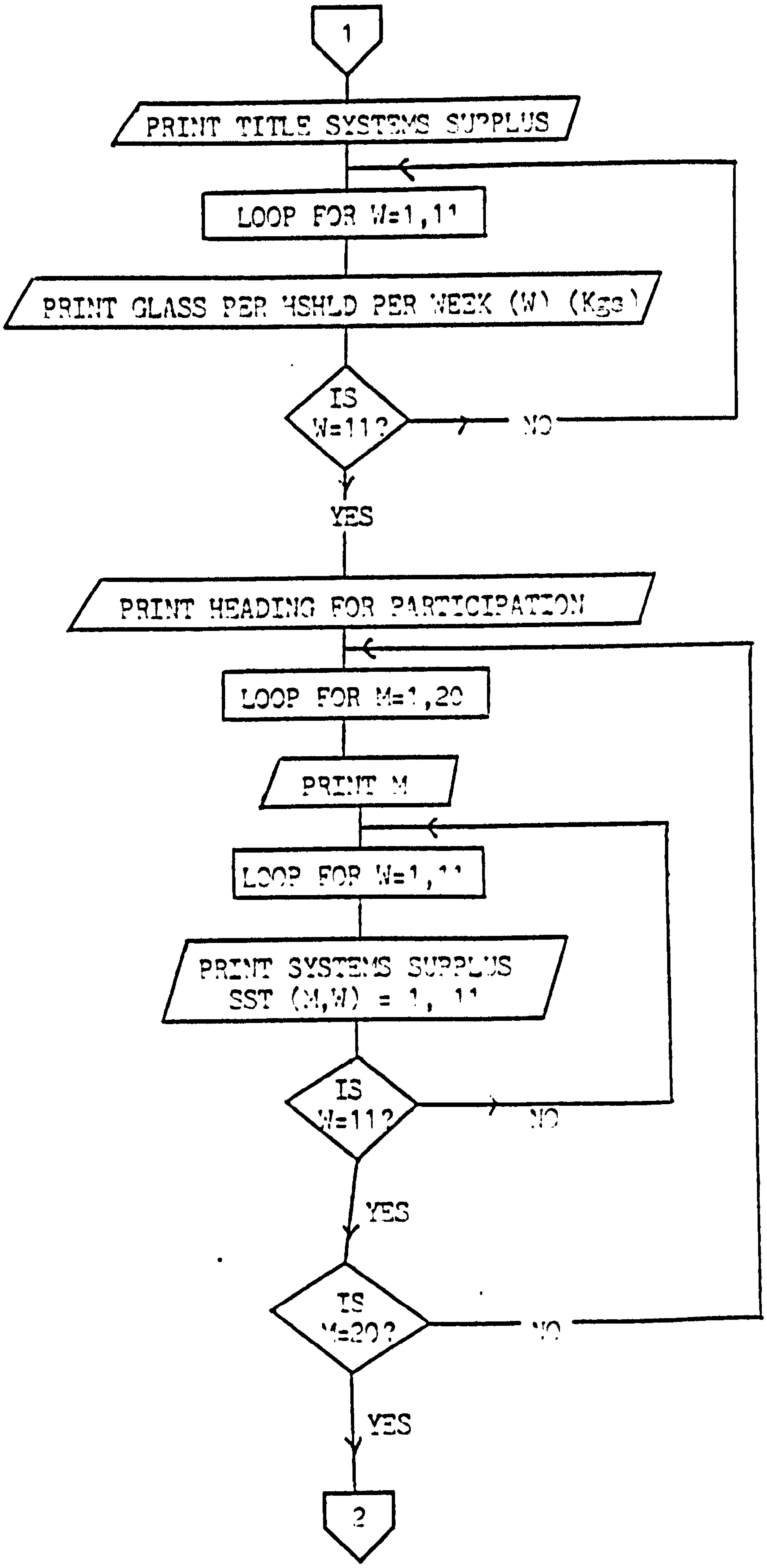

1
A
B
LOOP FOR M = 1 to 20
M = % Of Participating Households
LOOP FOR W = 2 to 11
W = kg per household per week
CALCULATE TONNAGE GLASS RECOVERED
And Store In GR(M,W)
GRT=0.052*(0.01*M*(0.1+0.1*(W-1))*ID)
GR(M,W)=GRT
Operating Costs
COLLECTION COSTS
CCPT = (H/D)
SITE MAINTENANCE
SMPT = (E/D)
SKIP MAINTENANCE
SKMPT = SKM/GRT
ADMINISTRATION
APT = KA/GRT
PUBLICITY COSTS
PUBPT = PUB/GRT
BULK TRANSPORT
BTR = TR + TL
STORAGE MAINTENANCE
STM = (WS * TS)
CRUSHER OPERATING COSTS
CUC = (LAB+FUEL+MAIN)/GRT
TOTAL OPERATING COSTS PER TONNE
OPC = CCPT+SMPT+SKMPT+APT+PUBPT+BTR+STM+CUC
GROSS OPERATING COSTS
GOPC = OPC*GRT
Income
REVENUE
TRA = TRS1+TRS2+TRS3+TRS4
SAVINGS IN REFUSE DISPOSAL COSTS
SRD = Y*GRT
SAVINGS IN REFUSE COLLECTION COSTS
SRC = C*GRT
2

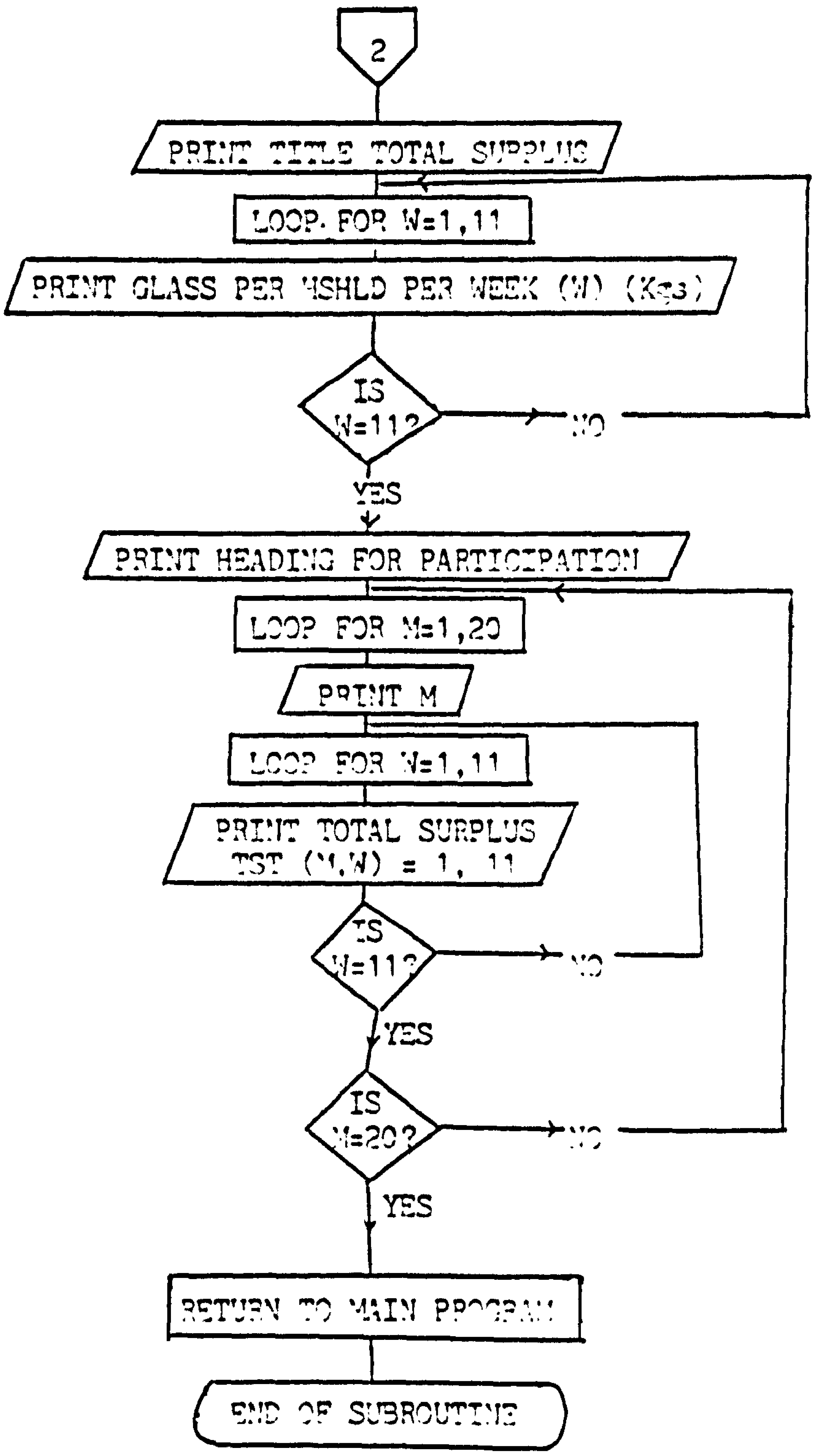
Net Costs


2
OPERATING PROFIT PER TONNE (PPT)
PPT(M,W) = (TRA-GOPC-SUC)/GR(M.W)
SYSTEMS SURPLUS (SST)
SST(M,W) = (TRA+SRD-GOPC-SUC)/GR(M,W)
TOTAL SYSTEMS SURPLUS (TST)
TST(M.W) = (TRA+SRD+SRC-GOPC-SUC)/GR(M,W)
BREAKEVEN PRICE (BEP)
BEP(M,W) = (GOPC+SUC-O)/GR(M,W)
IS W = 11?
NO
B
YES
IS M = 20?
NO
A
YES
RETURN TO MAIN PROGRAM
END SUBROUTINE

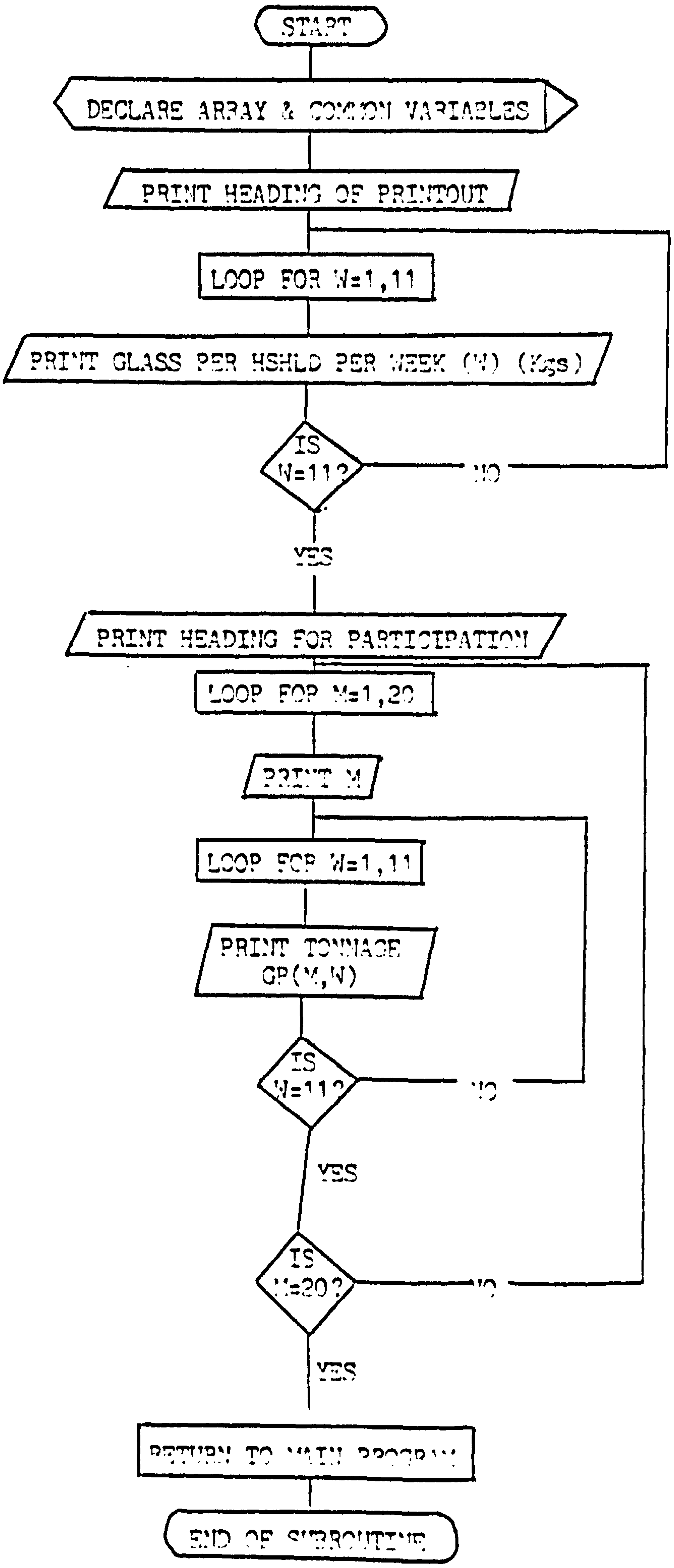
SUBROUTINE PROFITS



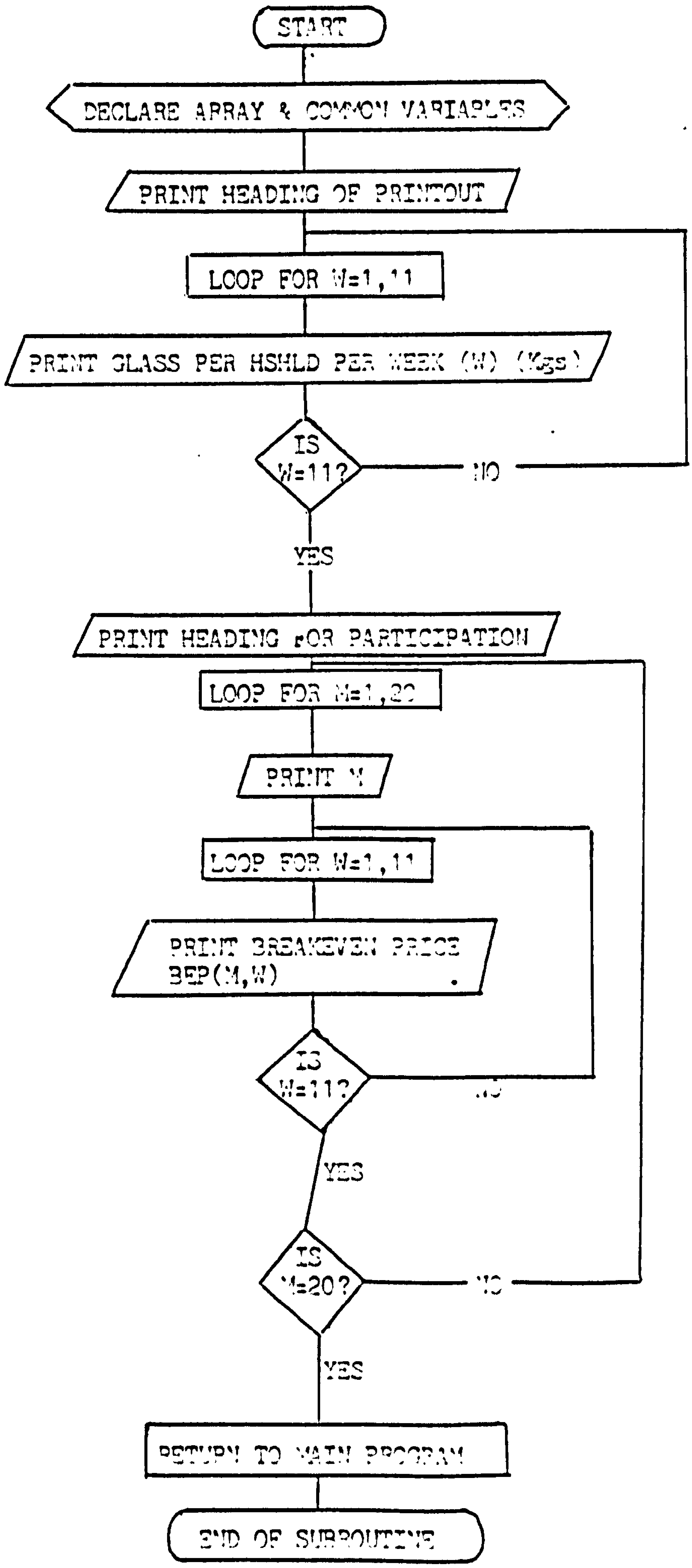

1
PRINT TITLE SYSTEMS SUPPLUS
LOOP FOR W=1,11
PRINT GLASS PER HSHLD PER WEEK (W) (Kgs)
IS W=11?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR M=1,20
PRINT M
LOOP FOR W=1,11
PRINT SYSTEMS SURPLUS SST (M,W) = 1, 11
IS W=11?
NO
YES
IS M=20?
NO
YES
2


2
PRINT TITLE TOTAL SURPLUS
LOOP FOR W=1,11
PRINT GLASS PER HSHLD PER WEEK (W) (Kgs)
IS W=11?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR M=1,20
PRINT M
LOOP FOR W=1,11
PRINT TOTAL SURPLUS TST (M,W) = 1, 11
IS W=11?
NO
YES
IS M=20?
NO
YES
RETURN TO MAIN PROGRAM
END OF SUBROUTINE

SUBROUTINE TONNAGE



SUBROUTINE BREAKEVEN



Appendix F

F.4 Data Input For The Bottle Bank Viability Model

VARIABLE	I
FORMAT	I1
VALUE	2

VARIABLE	ID	IP
VALUE	48837	126978

VARIABLE	Y	C	R
VALUE	1.49	19.0	0.0

VARIABLE	N	KC	B	BC	NMD	CMD	NSP	CSP
VALUE	8	746	0	0	0	0	0	0

VARIABLE	KS	RV
VALUE	1040	0

VARIABLE	IYC	IYS	PWLB
VALUE	5	10	10

VARIABLE	SKA	TAR	RAI	KL	L	CPR
VALUE	0	0	0	35	8	0

VARIABLE	KA	H	E	SKM	TR	TL
VALUE	100	9.47	0.15	80	4.0	0.5

VARIABLE	P1	P2	P3	P4
VALUE	22.0	18.0	18.0	18.0

VARIABLE	PCG	PGG	PAG	PMG
VALUE	0.6	0.0	0.0	0.4

VARIABLE	D
VALUE	3.0

TONNES OF WASTE GLASS RECOVERED / YR

GLASS PER DOM PREM PER WEEK (KG)

PERCENTAGE OF PARTICIPATION	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
1	2.5	5.1	7.6	10.2	12.7	15.2	17.8	20.3	22.9	25.4	27.9
2	5.1	10.2	15.2	20.3	25.4	30.5	35.6	40.6	45.7	50.8	55.9
3	7.6	15.2	22.9	30.5	38.1	45.7	53.3	60.9	68.6	76.2	83.8
4	10.2	20.3	30.5	40.6	50.8	60.9	71.1	81.3	91.4	101.6	111.7
5	12.7	25.4	38.1	50.8	63.5	76.2	88.9	101.6	114.3	127.0	139.7
6	15.2	30.5	45.7	60.9	76.2	91.4	106.7	121.9	137.1	152.4	167.6
7	17.8	35.6	53.3	71.1	88.9	106.7	124.4	142.2	160.0	177.8	195.5
8	20.3	40.6	60.9	81.3	101.6	121.9	142.2	162.5	182.8	203.2	223.5
9	22.9	45.7	68.6	[illegible]	[illegible]	[illegible]	160.0	182.6	205.7	228.6	251.4
10	25.4	50.8	76.2	101.6	[illegible]	[illegible]	[illegible]	203.2	228.6	254.0	279.3
11	27.9	55.9	83.8	111.7	139.7	167.6	195.5	223.5	251.4	279.3	307.3
12	30.5	60.9	91.4	121.9	152.4	182.8	213.3	243.8	274.3	304.7	335.2
13	33.0	66.0	99.0	132.1	165.1	198.1	231.1	264.1	297.1	330.1	363.2
14	35.6	71.1	106.7	142.2	177.8	213.3	248.9	284.4	320.0	355.5	391.1
15	38.1	76.2	114.3	152.4	190.5	228.6	266.7	304.7	342.8	380.9	419.0
16	40.6	81.3	121.9	162.5	203.2	243.8	284.4	325.1	365.7	406.3	447.0
17	43.2	86.3	129.5	172.7	215.9	259.0	302.2	345.4	388.5	431.7	474.9
18	45.7	91.4	137.1	182.8	228.6	274.3	320.0	365.7	411.4	457.1	502.8
19	48.3	96.5	144.8	193.0	241.3	289.5	337.8	386.0	434.3	482.5	530.8
20	50.8	101.6	152.4	[illegible]	254.0	304.7	355.5	406.3	457.1	507.9	558.7

A185

GLASS PER PREM PER WK (KG)

PERCENTAGE OF PARTICIPATION	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
1	1300.0	653.9	438.5	330.8	266.2	223.1	192.3	169.2	151.3	136.9	125.2
2	653.9	330.8	223.1	169.2	136.9	115.4	100.0	88.5	79.5	72.3	66.4
3	438.5	223.1	151.3	115.4	93.9	79.5	69.2	61.6	55.6	50.8	46.9
4	330.8	169.2	115.4	88.5	72.3	61.6	53.9	48.1	43.6	40.0	37.1
5	266.2	136.9	93.9	72.3	59.4	50.8	44.6	40.0	36.4	33.6	31.2
6	223.1	115.4	79.5	61.6	50.8	43.6	38.5	34.6	31.6	29.2	27.3
7	192.3	100.0	69.2	53.9	44.6	38.5	34.1	30.8	28.2	26.2	24.5
8	169.2	88.5	61.6	48.1	40.0	34.6	30.8	27.9	25.7	23.9	22.4
9	151.3	79.5	55.6	43.6	36.4	31.6	28.2	25.7	23.7	22.1	20.8
10	136.9	72.3	50.8	40.0	33.6	29.2	26.2	23.9	22.1	20.6	19.5
11	125.2	66.4	46.9	37.1	31.2	27.3	24.5	22.4	20.8	19.5	18.4
12	115.4	61.6	43.6	34.6	29.2	25.7	23.1	21.2	19.7	18.5	17.5
13	107.1	57.4	40.8	32.6	27.6	24.3	21.9	20.1	18.8	17.6	16.7
14	100.0	53.9	38.5	30.8	26.2	23.1	20.9	19.2	18.0	16.9	16.1
15	93.9	50.8	36.4	29.2	24.9	22.1	20.0	18.5	17.3	16.3	15.5
16	88.5	48.1	34.6	27.9	23.9	21.2	19.2	17.8	16.7	15.8	15.0
17	83.7	45.7	33.0	26.7	22.9	20.4	18.6	17.2	16.2	15.3	14.6
18	79.5	43.6	31.6	25.7	22.1	19.7	18.0	16.7	15.7	14.9	14.2
19	75.7	41.7	30.4	24.7	21.3	19.0	17.4	16.2	15.3	14.5	13.9
20	72.3	40.0	29.2	23.9	20.6	18.5	16.9	15.8	14.9	14.2	13.6
21	69.2	38.5	28.2	23.1	20.0	18.0	16.5	15.4	14.5	13.9	13.3

LA GLASS RECOVERY VIABILITY MODEL
PROFIT/LOSS / TONNE WASTE GLASS
PRICE OF CLEAR GLASS PER TONNE = 22.00
PRICE OF GREEN GLASS PER TONNE = 18.00

GLASS PER DOM PREM PER WK(KG)

PERCENTAGE OF PARTICIPATION	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
1	-1279.62	-633.47	-418.08	-310.39	-245.77	-202.69	-171.92	-148.85	-130.90	-116.54	-104.79
2	-633.47	-310.39	-202.69	-148.85	-116.54	-95.00	-79.62	-68.08	-59.10	-51.92	-46.05
3	-418.08	-202.69	-130.90	-95.00	-73.46	-59.10	-48.85	-41.15	-35.17	-30.38	-26.47
4	-310.39	-148.85	-95.00	-68.08	-51.92	-41.15	-33.46	-27.69	-23.20	-19.61	-16.68
5	-245.77	-116.54	-73.46	-51.92	-35.00	-30.38	-24.23	-19.61	-16.02	-13.15	-10.80
6	-202.69	-95.00	-59.10	-41.15	-30.38	-23.20	-18.08	-14.23	-11.24	-8.85	-6.89
7	-171.92	-79.62	-48.85	-33.46	-24.23	-18.08	-13.68	-10.38	-7.82	-5.77	-4.09
8	-148.85	-68.08	-41.15	-27.69	-19.61	-14.23	-10.38	-7.50	-5.26	-3.46	-1.99
9	-130.90	-59.10	-35.17	-23.20	-16.02	-11.24	-7.82	-5.26	-3.26	-1.67	-0.36
10	-116.54	-51.92	-30.38	-19.61	-13.15	-8.85	-5.77	-3.46	-1.67	-0.23	0.94
11	-104.79	-46.05	-26.47	-16.68	-10.80	-6.89	-4.09	-1.99	-0.36	0.94	2.01
12	-95.00	-41.15	-23.20	-14.23	-8.85	-5.26	-2.69	-0.77	0.73	1.92	2.90
13	-86.72	-37.01	-20.44	-12.16	-7.15	-3.87	-1.51	0.27	1.65	2.75	3.66
14	-79.62	-33.46	-18.08	-10.38	-5.77	-2.69	-0.49	1.15	2.44	3.46	4.30
15	-73.46	-30.38	-16.02	-8.85	-4.54	-1.57	0.39	1.92	3.12	4.08	4.86

SYSTEMS SURPLUS

GLASS PER DOM PREM PER WK (KG)

Percentage Of Participation	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
1	-1278.20	-632.05	-416.66	-308.97	-244.35	-201.27	-170.50	-147.43	-129.48	-115.12	-103.37
2	-632.05	-308.97	-201.27	-147.43	-115.12	-93.58	-78.20	-66.66	-57.68	-50.50	-44.63
3	-416.66	-201.27	-129.48	-93.58	-72.04	-57.68	-47.43	-39.73	-33.75	-28.96	-25.05
4	-308.97	-147.43	-93.58	-66.66	-50.50	-39.73	-32.04	-26.27	-21.78	-18.19	-15.26
5	-244.35	-115.12	-72.04	-50.50	-37.58	-28.96	-22.81	-18.19	-14.60	-11.73	-9.38
6	-201.27	-93.58	-57.68	-39.73	-28.96	-21.78	-16.66	-12.81	-9.82	-7.43	-5.47
7	-170.50	-78.20	-47.43	-32.04	-22.81	-16.66	-12.26	-8.98	-6.40	-4.35	-2.67
8	-147.43	-66.66	-39.73	-26.27	-18.19	-12.81	-8.98	-6.08	-3.84	-2.04	-0.57
9	-129.48	-57.68	-33.75	-21.78	-14.60	-9.82	-6.40	-3.84	-1.84	-0.25	1.06
10	-115.12	-50.50	-28.96	-18.19	-11.73	-7.43	-4.35	-2.04	-0.25	1.19	2.36
11	-103.37	-44.63	-25.05	-15.26	-9.38	-5.47	-2.67	-0.57	1.06	2.36	3.43
12	-93.58	-39.73	-21.78	-12.81	-7.43	-3.84	-1.27	0.65	2.15	3.34	4.32
13	-85.30	-35.59	-19.02	-10.74	-5.77	-2.43	-0.09	1.69	3.07	4.17	5.08
14	-78.20	-32.04	-16.66	-8.96	-4.35	-1.27	0.93	2.57	3.86	4.88	5.72
15	-72.04	-28.96	-14.60	-7.43	-3.12	-0.25	1.81	3.34	4.54	5.50	6.28
16	-66.66	-26.27	-12.81	-6.08	-2.04	0.65	2.57	4.02	5.14	6.04	6.77
17	-61.91	-23.90	-11.23	-4.89	-1.09	1.44	3.25	4.61	5.67	6.51	7.20
18	-57.68	-21.78	-9.82	-3.84	-0.25	2.15	3.86	5.14	6.14	6.93	7.59
19	-53.90	-19.90	-8.56	-2.89	0.51	2.78	4.40	5.61	6.56	7.31	7.93
20	-50.50	-18.19	-7.43	-2.04	1.19	3.34	4.88	[illegible]	6.93	7.65	8.24
21	-47.43	-16.66	-6.40	-1.27	1.81	3.82	5.32	6.42	7.28	7.96	8.52

TOTAL SYSTEMS SURPLUS
GLASS PER PREY PER WK (KG)

Percentage Of Participation	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
1	-1259.20	-613.05	-397.66	-289.97	-225.35	-182.27	-151.50	-128.43	-110.48	-96.12	-84.37
2	-613.05	-289.97	-182.27	-128.43	-96.12	-74.58	-59.20	-47.66	-38.68	-31.50	-25.63
3	-397.66	-182.27	-110.48	-74.58	-53.04	-38.68	-28.43	-20.73	-14.75	-9.96	-6.05
4	-289.97	-128.43	-74.58	-47.66	-31.50	-20.73	-13.04	-7.27	-2.78	0.81	3.74
5	-225.35	-96.12	-53.04	-31.50	-18.58	-9.96	-3.81	0.81	4.40	7.27	9.62
6	-182.27	-74.58	-38.68	-20.73	-9.96	-2.78	2.34	6.19	9.18	11.57	13.53
7	-151.50	-59.20	-28.43	-13.04	-3.81	2.34	6.74	10.04	12.60	14.65	16.33
8	-128.43	-47.66	-20.73	-7.27	0.81	6.19	10.04	12.92	15.16	16.96	18.43
9	-110.48	-38.68	-14.75	-2.78	4.40	9.18	12.60	15.16	17.16	18.75	20.06
10	-96.12	-31.50	-9.96	0.81	7.27	11.57	14.65	16.96	18.75	20.19	21.36
11	-84.37	-25.63	-6.05	3.74	9.62	13.53	16.33	18.43	20.06	21.36	22.43
12	-74.58	-20.73	-2.78	6.19	11.57	15.16	17.73	19.65	21.15	22.34	23.32
13	-66.30	-16.59	-0.02	8.26	13.23	16.55	18.91	20.69	22.07	23.17	24.08
14	-59.20	-13.04	2.34	10.04	14.65	17.77	19.93	21.57	22.86	23.88	24.72
15	-53.04	-9.96	4.40	11.57	15.38	18.75	20.31	22.34	23.54	24.50	25.28
16	-47.66	-7.27	6.19	12.92	16.96	19.65	21.57	23.02	24.14	25.04	25.77
17	-42.91	-4.90	7.77	[illegible]	[illegible]	[illegible]	22.25	[illegible]	24.67	25.51	26.20
18	-38.68	-2.78	9.18	15.16	18.75	21.15	22.86	24.14	25.14	25.93	26.59
19	-34.90	-0.90	10.44	16.11	[illegible]	21.78	23.40	24.61	25.56	26.31	26.93
20	-31.50	0.81	11.57	16.96	20.19	22.34	23.88	25.04	25.93	26.65	27.24
21	-28.43	2.34	12.60	17.73	[illegible]	22.86	24.72	25.40	26.28	26.96	27.52

Appendix F

F.6 Variations On Key Factors From The Base Case

F.6.1 Changes In Bottle Bank Life (IYC)

Glass/Dom Prem/Week W	Participtn Rate (%) M	Tonnage Recovered (tonnes) GRT	Bottle Bank Life IYC	Private Profit /Loss PPT	Systems Surplus SST	Total Systems Surplus TST
10	10	254	5	-0.23	1.19	20.19
			7	1.11	2.53	21.53
			10	2.12	3.54	22.54
			20	3.30	4.72	23.75
4	10	101.6	5	-19.61	-18.19	0.81
			7	-16.26	-14.84	4.16
			10	-13.73	-12.31	6.69
			20	-10.80	- 9.38	9.62
4	20	203.2	5	- 3.46	- 2.04	16.96
			7	- 1.78	- 0.36	18.64
			10	- 0.52	0.90	19.90
			20	0.95	2.37	21.37
10	20	507.9	5	6.23	7.65	26.65
			7	6.90	8.32	27.32
			10	7.41	8.83	27.83
			20	7.99	9.41	28.41

FIGURE F6 .1a Effect Of Changes On Bottle Bank Life (IYC) On Viability Measures PPT, SST, TST

(W=10, M=10, GRT=254)

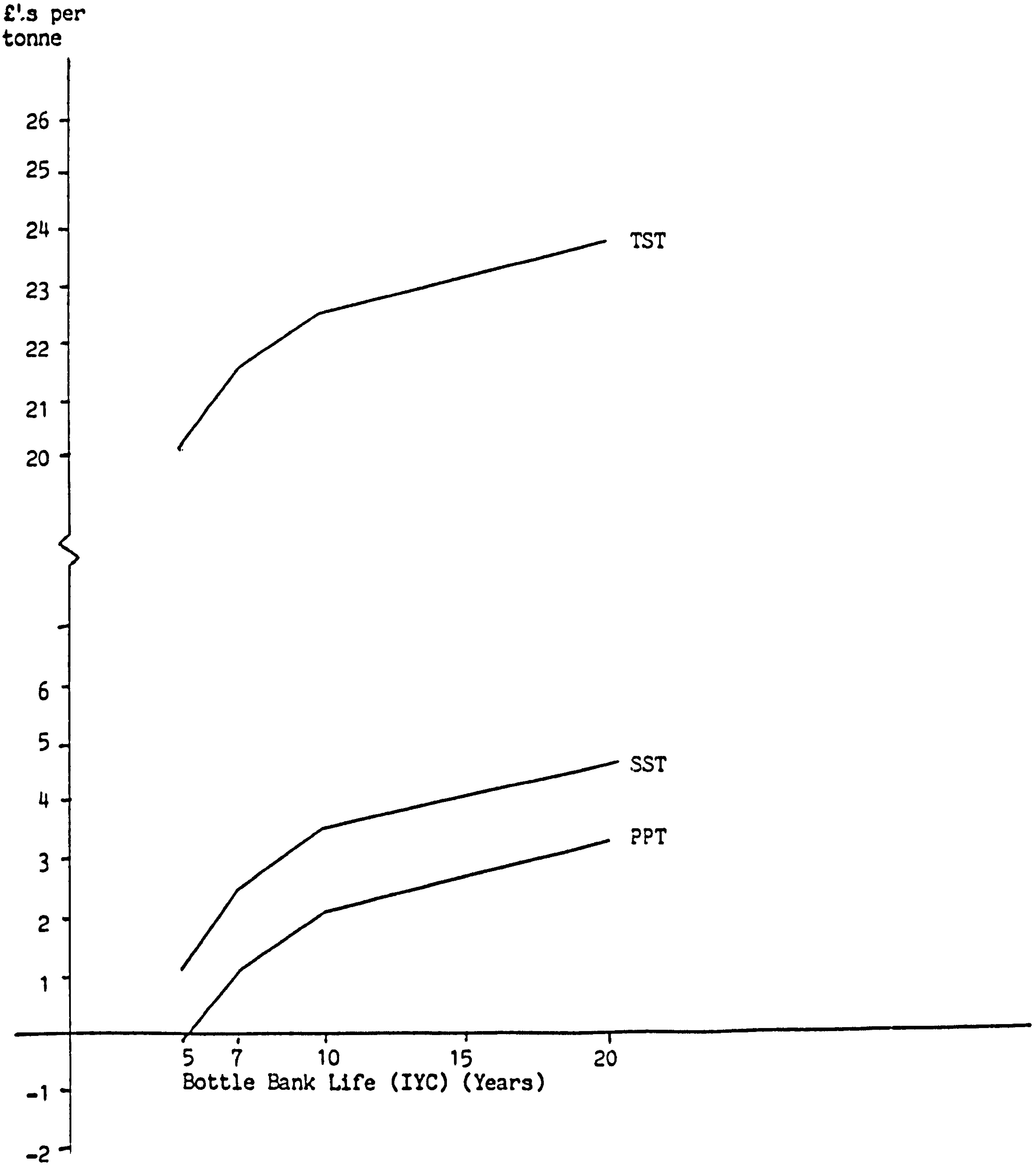


FIGURE F6 .1b Effect Of Changes On Bottle Bank Life (IYC) On Viability Measures PPT, SST, TST

(W=4, M=10, GRT=101.6)

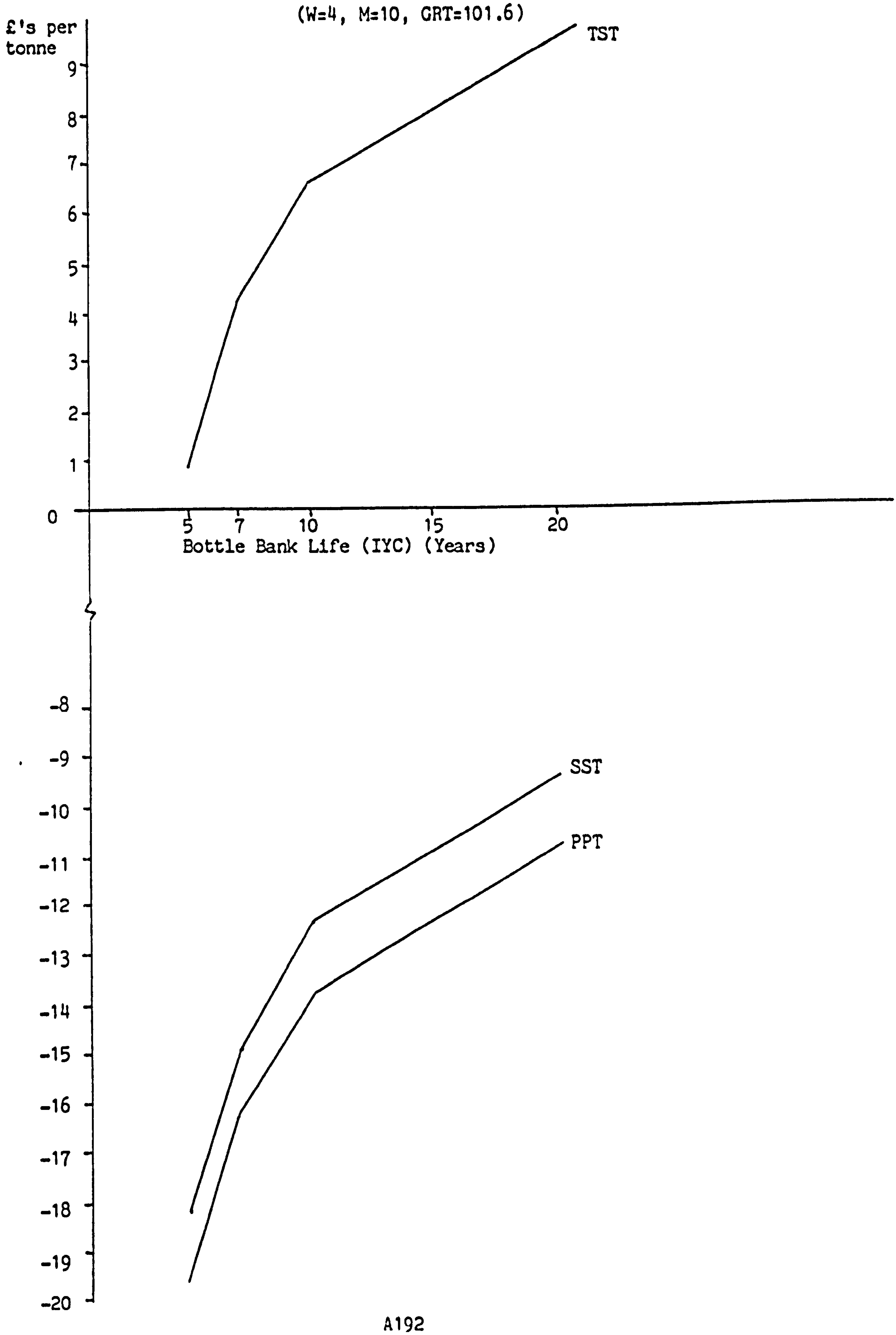


FIGURE F6.1c Effect Of Changes On Bottle Bank Life (IYC) On Viability Measures: PPT, SST, TST

(W=4, M=20, GRT=203.2)

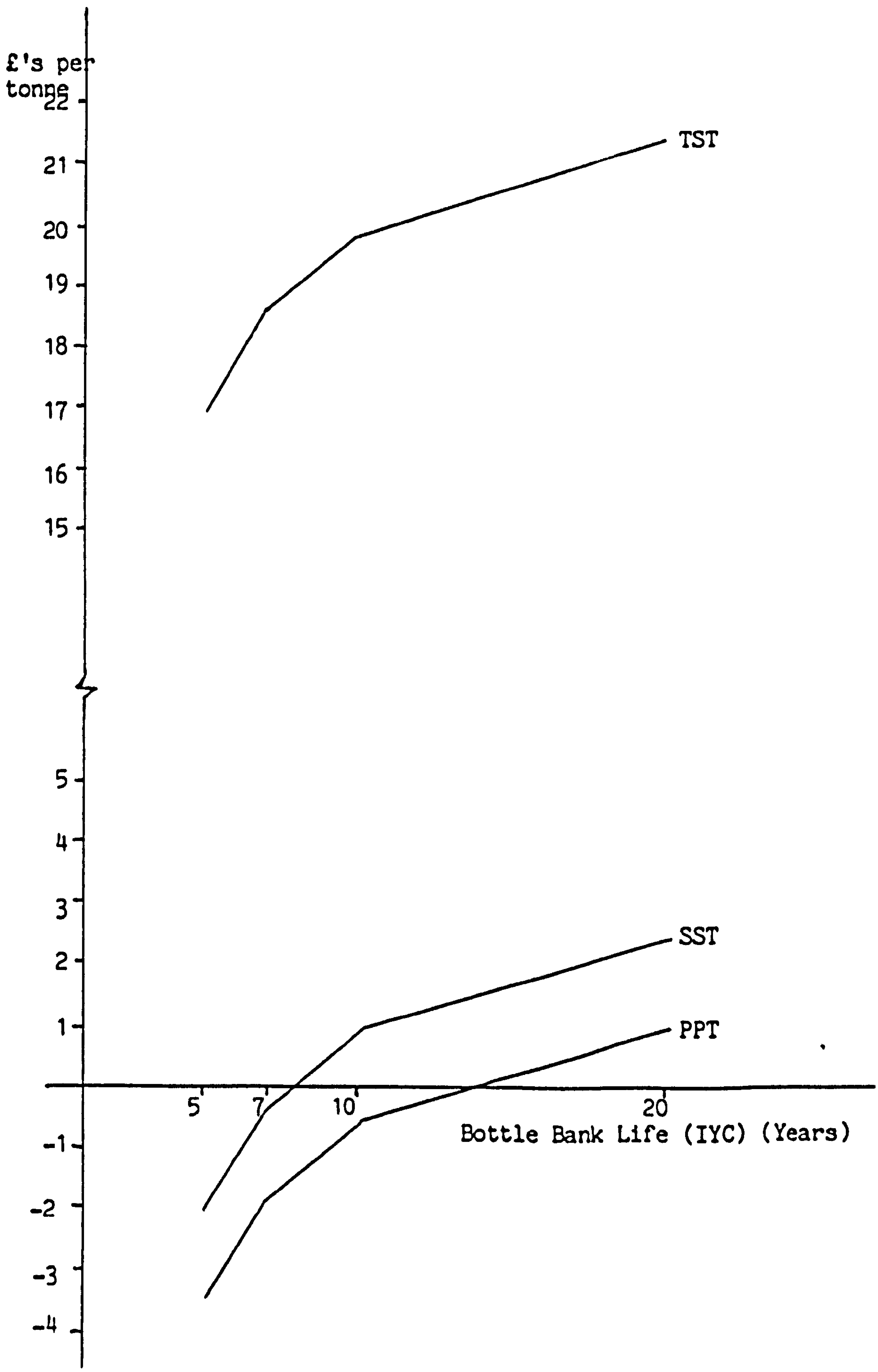
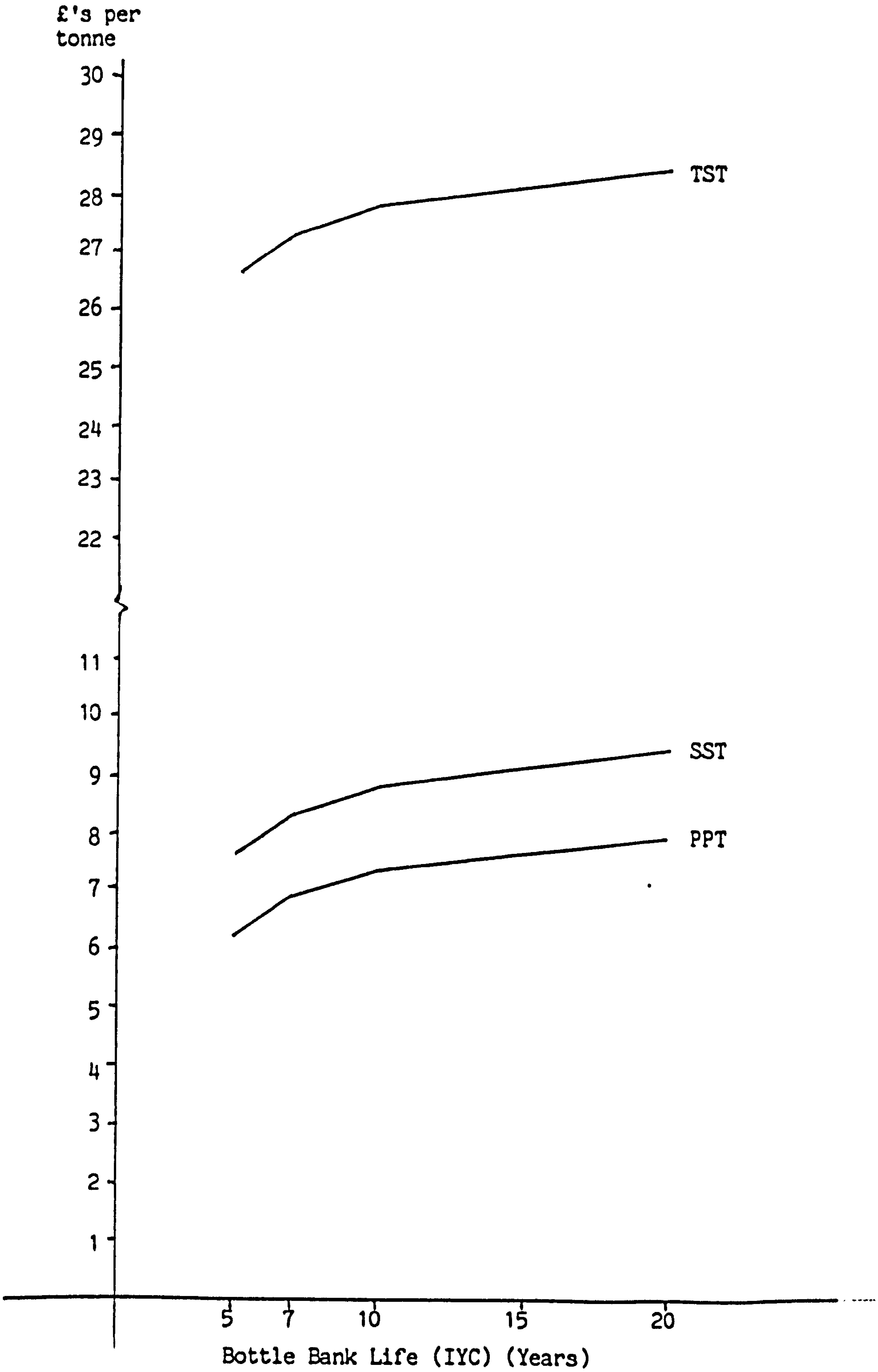


FIGURE F6 .1d Effect Of Changes On Bottle Bank Life (IYC) On Viability Measures, PPT, SST, TST

(W=10, M=20, GRT=507.9)



F.6.2 Changes In Bottle Bank Costs (BKC= 0 to 1100)

Glass/Dom Prem/Week W	Participtn Rate (%) M	Tonnage Recovered (tonnes) GRT	Bottle Bank Cost BKC	Private Profit /Loss PPT	Disposal Systems Surplus SST	Total Systems Surplus TST
10	10	254	0	6.82	8.24	27.24
			100	5.87	7.29	26.29
			200	4.93	6.35	25.35
			300	3.98	5.40	24.4
			400	3.04	4.46	23.46
			500	2.09	3.51	22.51
			600	1.15	2.57	21.57
			700	0.20	1.62	20.62
			746	-0.23	1.19	20.19
			800	-0.74	0.68	19.68
			900	-1.69	-0.27	18.73
			1000	-2.63	-1.21	17.79
			1100	-3.58	-2.16	16.84
4	10	101.6	0	-2.00	-0.58	18.42
			100	-4.36	-2.94	16.06
			200	-6.72	-5.30	13.70
			300	-9.09	-7.67	11.33
			400	-11.45	-10.03	8.97
			500	-13.81	-12.39	6.61
			600	-16.17	-14.75	4.25
			700	-18.54	-17.12	1.88
			746	-19.61	-18.19	0.81
			800	-20.90	-19.48	-0.48
			900	-23.26	-21.84	-2.84
			1000	-25.62	-24.20	-5.20
			1100	-27.99	-26.57	-7.57

F.6.2 (Cont) Changes In Bottle Bank Costs (BKC= 0 to 1100)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Bottle Bank Cost	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	BKC	PPT	SST	TST
4	20	203.2	0	5.35	6.77	25.77
			100	4.17	5.59	24.59
			200	2.98	4.40	23.40
			300	1.80	3.22	22.22
			400	0.62	2.04	21.04
			500	-0.56	0.86	19.86
			600	-1.74	-0.32	18.68
			700	-2.92	-1.50	17.50
			746	-3.46	-2.04	16.96
			800	-4.10	-2.68	16.32
			900	-5.28	-3.86	15.14
			1000	-6.47	-5.05	13.95
			1100	-7.65	-6.23	12.77
W	M	GRT	BKC	PPT	SST	TST
10	20	507.9	0	9.76	11.18	30.18
			100	9.28	10.70	29.70
			200	8.81	10.23	29.23
			300	8.34	9.76	28.76
			400	7.86	9.28	28.28
			500	7.39	8.81	27.81
			600	6.92	8.34	27.34
			700	6.45	7.87	26.87
			746	6.23	7.65	26.65
			800	5.97	7.39	26.39
			900	5.50	6.92	25.92
			1000	5.03	6.45	25.45
			1100	4.56	5.98	24.98

FIGURE F6.2a Effect On Viability Measures (PPT, SST, TST) OF Changes In Costs Of Bottle Banks (£'s)

FIGURE E6.2b Effects Of Changes In Bottle Bank Costs (BKC) On Viability Measures (PPT, SST, TST)

(W=4, M=10, GRT=101.6)

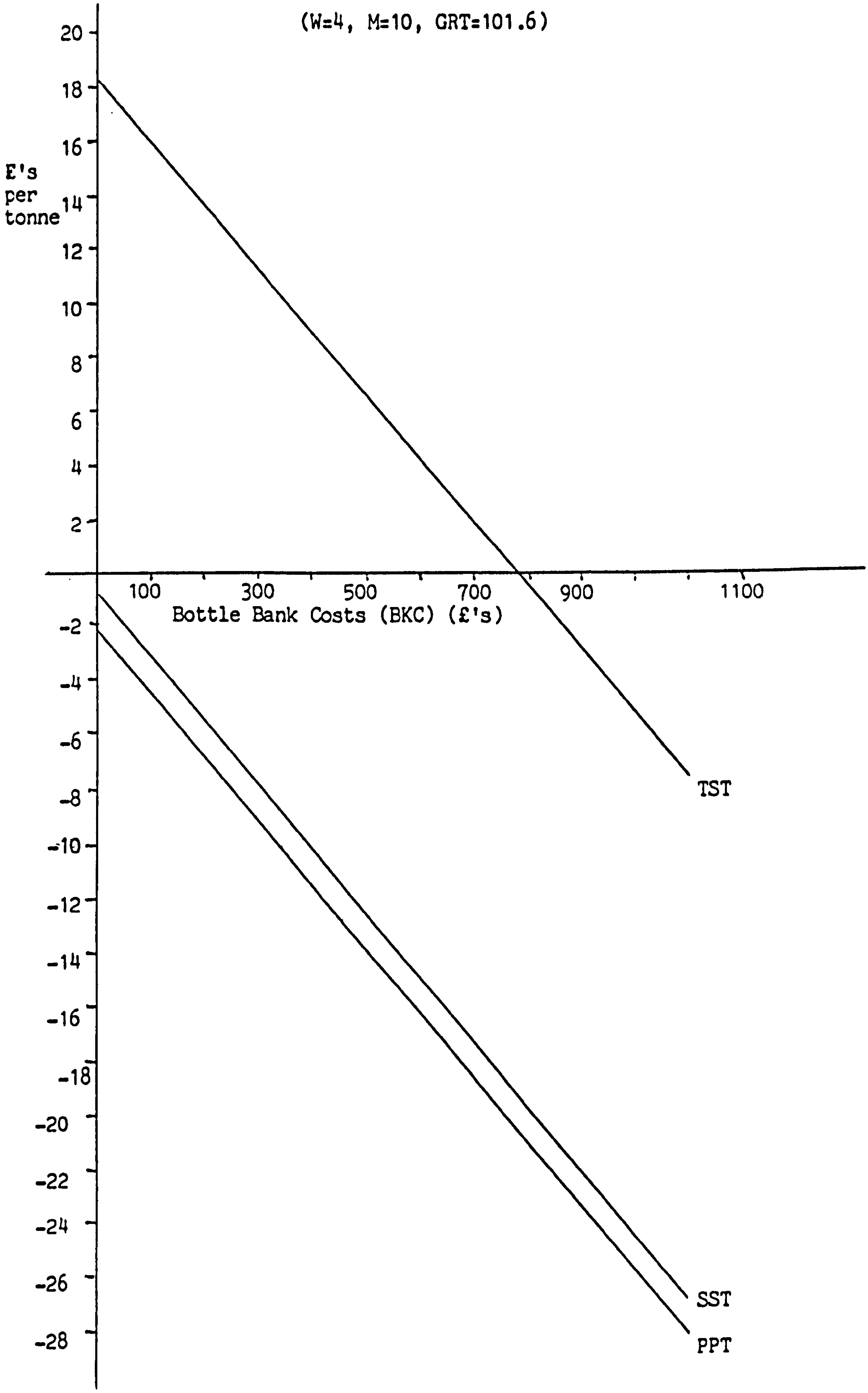


FIGURE F6.2c Effects Of Changes In Bottle Bank Costs (BKC) On Viability Measures (PPT, SST, TST)

(W=4, M=20, GRT=203.2)

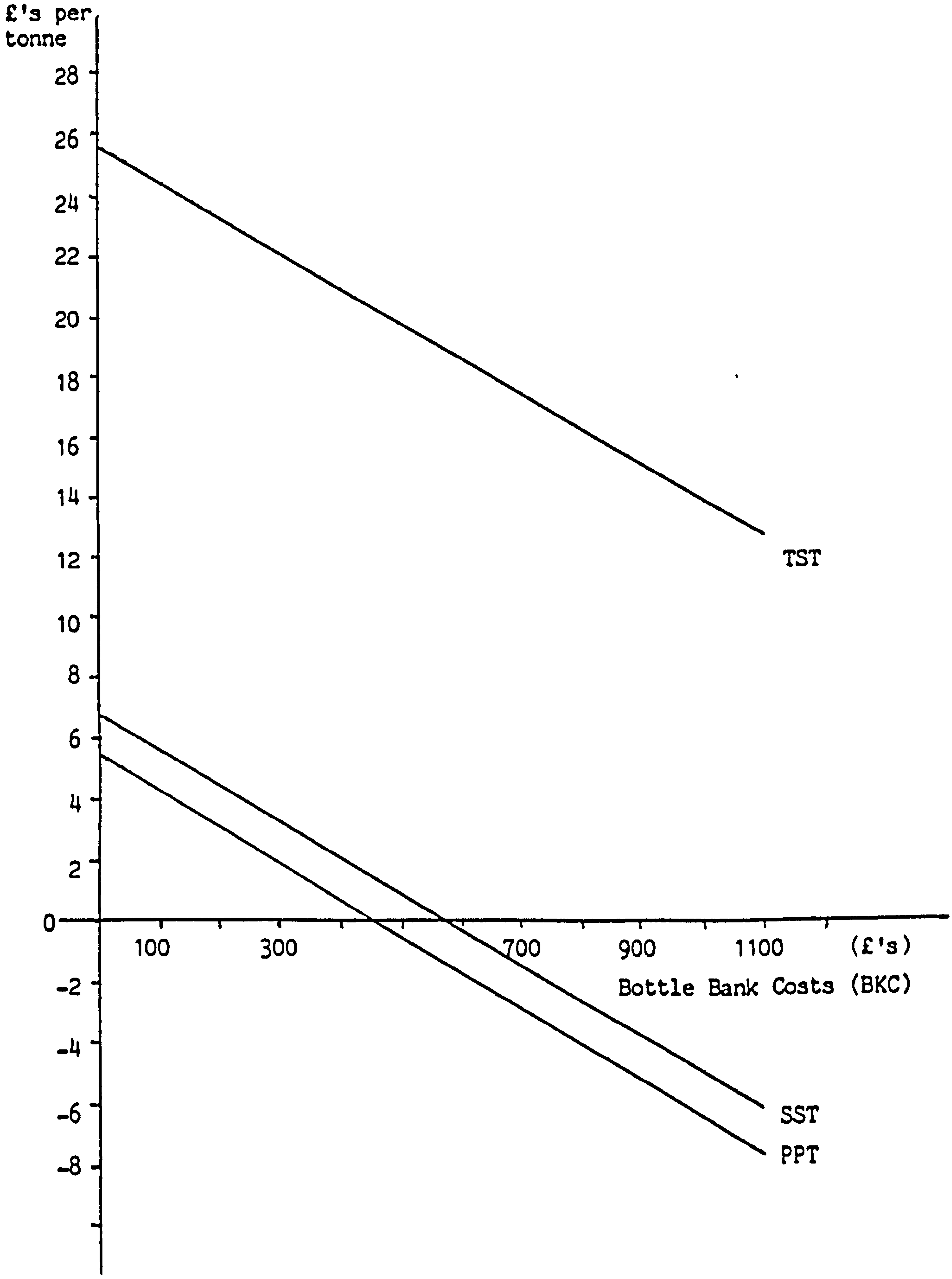
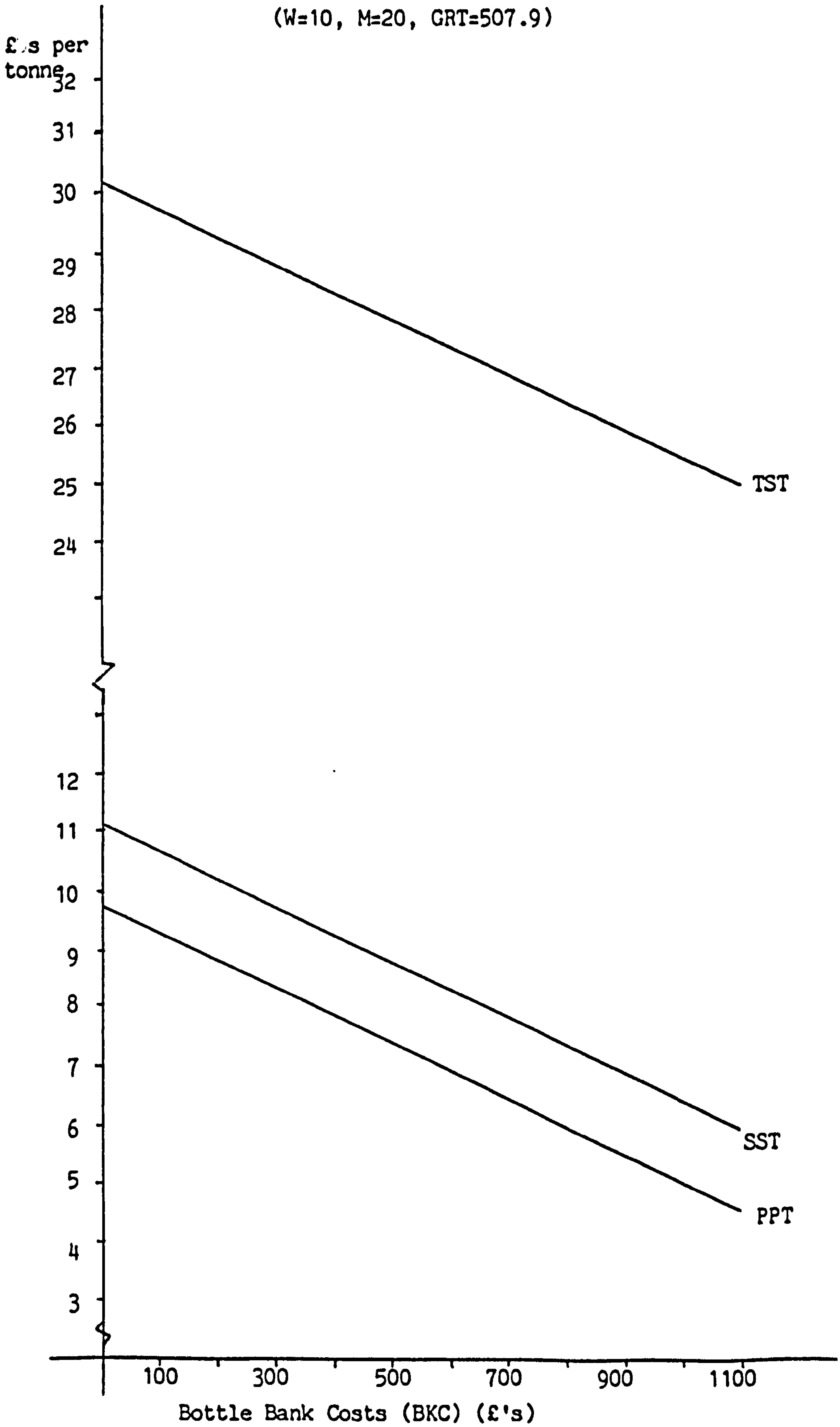


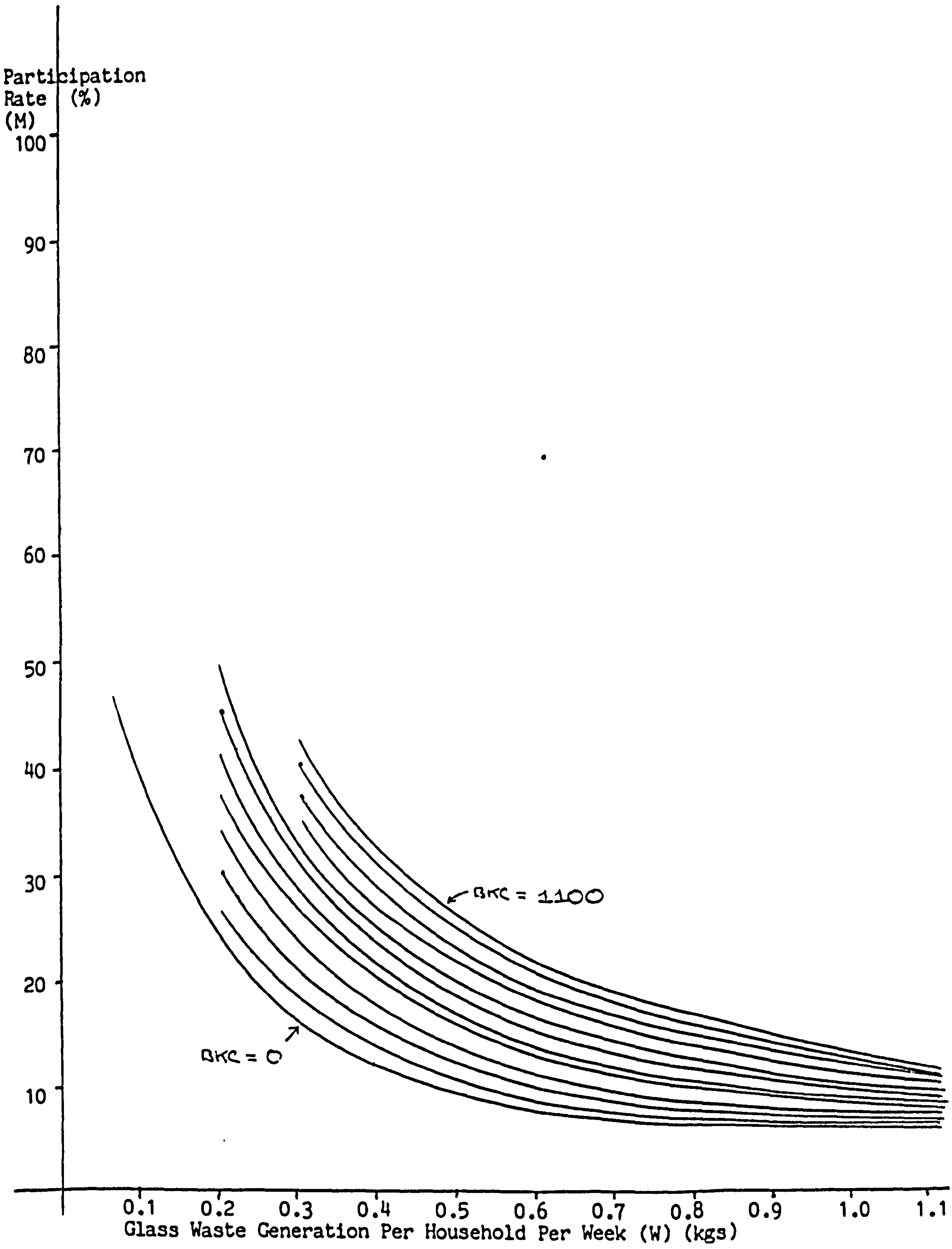
FIGURE F6.2d Effects On Viability Measures PPT, SST, TST Of Changes In Costs Of Bottle Banks (BKC) (W=10, M=20, GRT=507.9)



F.6.3 Effect Of Changes Of Bottle Bank Costs On Profit/Loss Breakeven Boundary (PPT)

BANK COSTS BKC	WASTE GENERATION W (Kilogrammes) 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
0	46/47	23/24	15/16	11/12	9/10	7/8	6/7	5/6	5/6	4/5	4/5
100	-	26/27	17/18	13/14	10/11	8/9	7/8	6/7	5/6	5/6	4/5
200	-	30/31	20/21	15/16	12/13	10/11	8/9	7/8	6/7	6/7	5/6
300	-	34/35	22/23	17/18	13/14	11/12	9/10	8/9	7/8	6/7	6/7
400	-	38/39	25/26	19/20	15/16	12/13	10/11	9/10	8/9	7/8	6/7
500	-	41/42	27/28	20/21	16/17	13/14	11/12	10/11	9/10	8/9	7/8
600	-	45/46	30/31	22/23	18/19	15/16	12/13	11/12	10/11	9/10	8/9
700	-	49/50	32/33	24/25	19/20	16/17	14/15	12/13	10/11	9/10	8/9
746	-	-	33/34	25/26	20/21	16/17	14/15	12/13	11/12	10/11	9/10
800	-	-	35/36	26/27	21/22	17/18	15/16	13/14	11/12	10/11	9/10
900	-	-	37/38	28/29	22/23	18/19	16/17	14/15	12/13	11/12	10/11
1000	-	-	40/41	30/31	24/25	20/21	17/18	15/16	13/14	12/13	10/11
1100	-	-	42/43	32/33	25/26	21/22	18/19	16/17	14/15	12/13	11/12

FIGURE F6.3a Effects On Profit/Loss Boundary (PPT) Of Changes On Bottle Bank Costs



F.6.4 Effects Of Changes In Interest Rates (PWLB) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Interest Rates (%)	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	PWLB	PPT	SST	TST
10	10	254	5	1.15	2.57	21.57
			7	0.60	2.02	21.02
			10	-0.23	1.19	20.19
			12	-0.78	0.64	19.64
			15	-1.61	-0.19	18.81
			17	-2.16	-0.74	18.26
			20	-2.99	-1.57	17.43
W	M	GRT	PWLB	PPT	SST	TST
4	10	101.6	5	-16.17	-14.75	4.25
			7	-17.54	-16.12	2.88
			10	-19.61	-18.19	0.81
			12	-20.99	-19.57	-0.57
			15	-23.06	-21.64	-2.64
			17	-24.43	-23.01	-4.01
			20	-26.51	-25.09	-6.09
W	M	GRT	PWLB	PPT	SST	TST
4	20	203.2	5	-1.74	-0.32	18.68
			7	-2.42	-1.00	18.00
			10	-3.46	-2.04	16.96
			12	-4.15	-2.73	16.27
			15	-5.18	-3.76	15.24
			17	-5.87	-4.45	14.55
			20	-6.91	-5.49	13.51
W	M	GRT	PWLB	PPT	SST	TST
10	20	507.9	5	6.92	8.34	27.34
			7	6.65	8.07	27.07
			10	6.23	7.65	26.65
			12	5.96	7.38	26.38
			15	5.54	6.96	25.96
			17	5.27	6.69	25.69
			20	4.85	6.27	25.27

FIGURE F6.4a Effects Of Changes In Interest Rates (PWLB)
On Viability Measures (PPT, SST, TST)
(W=10, M=10, GRT=254)

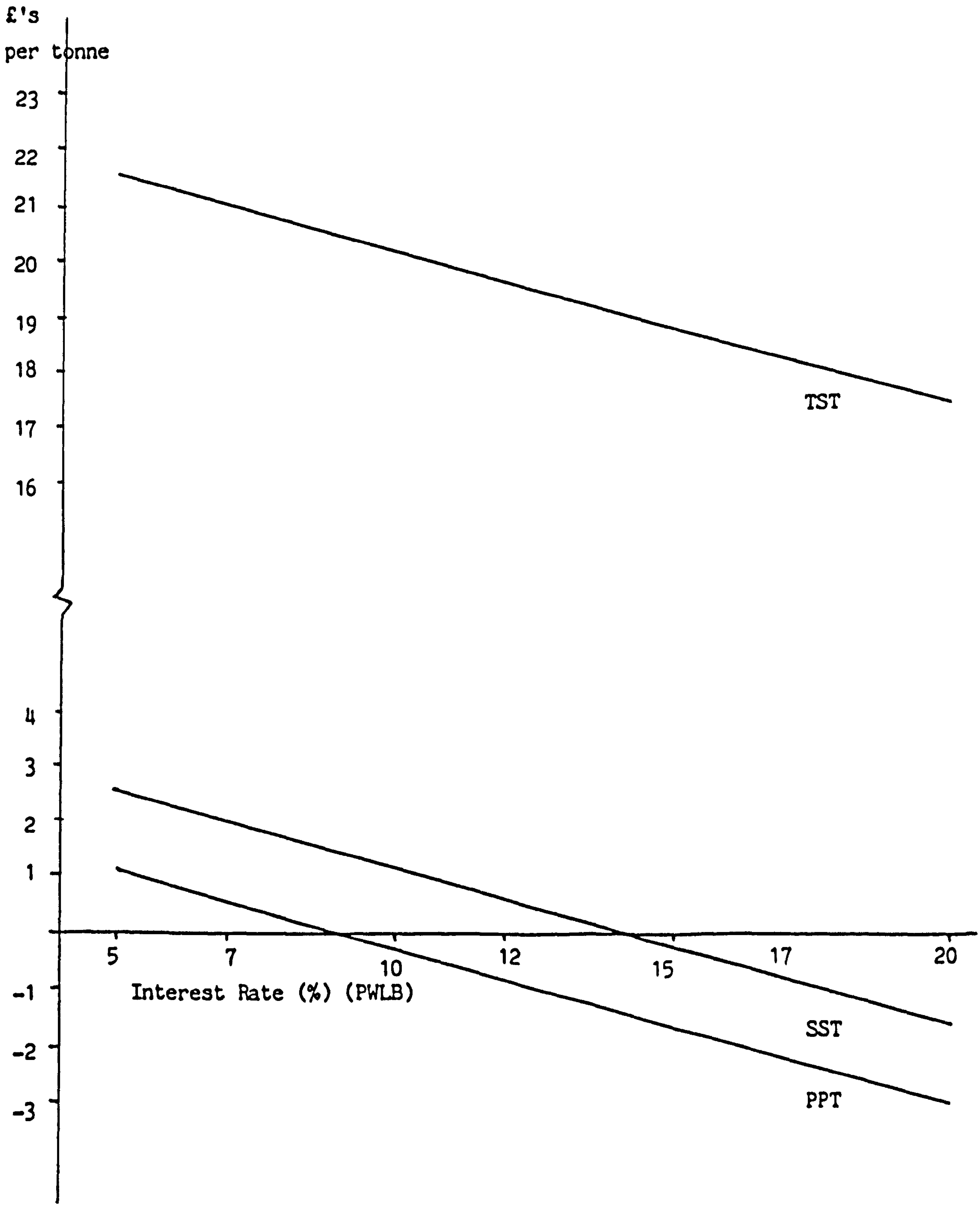


FIGURE F6.4b Effects Of Changes In Interest Rates (PWLB) On Viability Measures (PPT, SST, TST) (W=4, M=20, GRT=203.2)

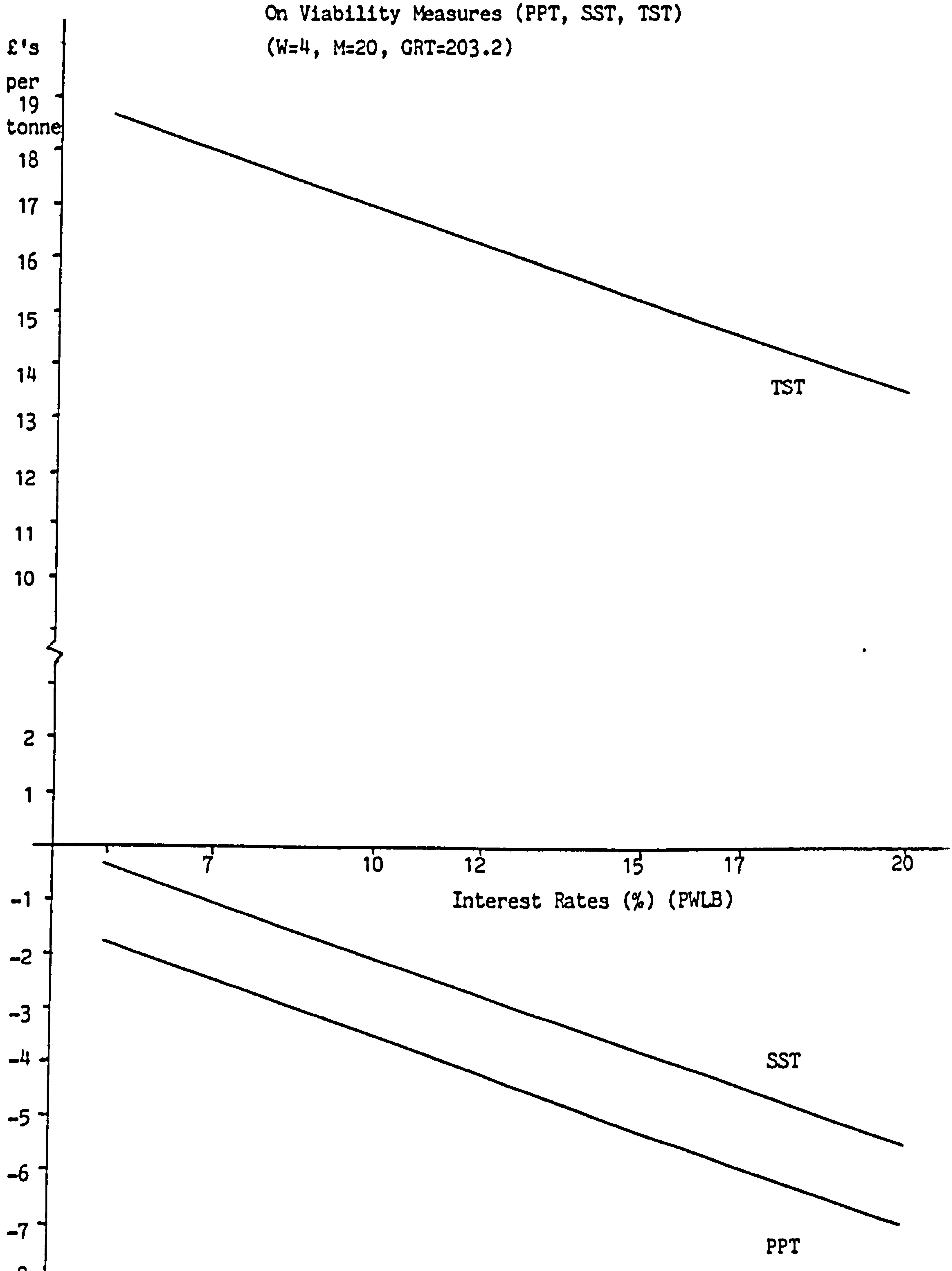


FIGURE F6 .4c Effects Of Changes In Interest Rates (PWLB) On Viability Measures (PPT, SST, TST) (W=4, M=10, GRT=101.6)

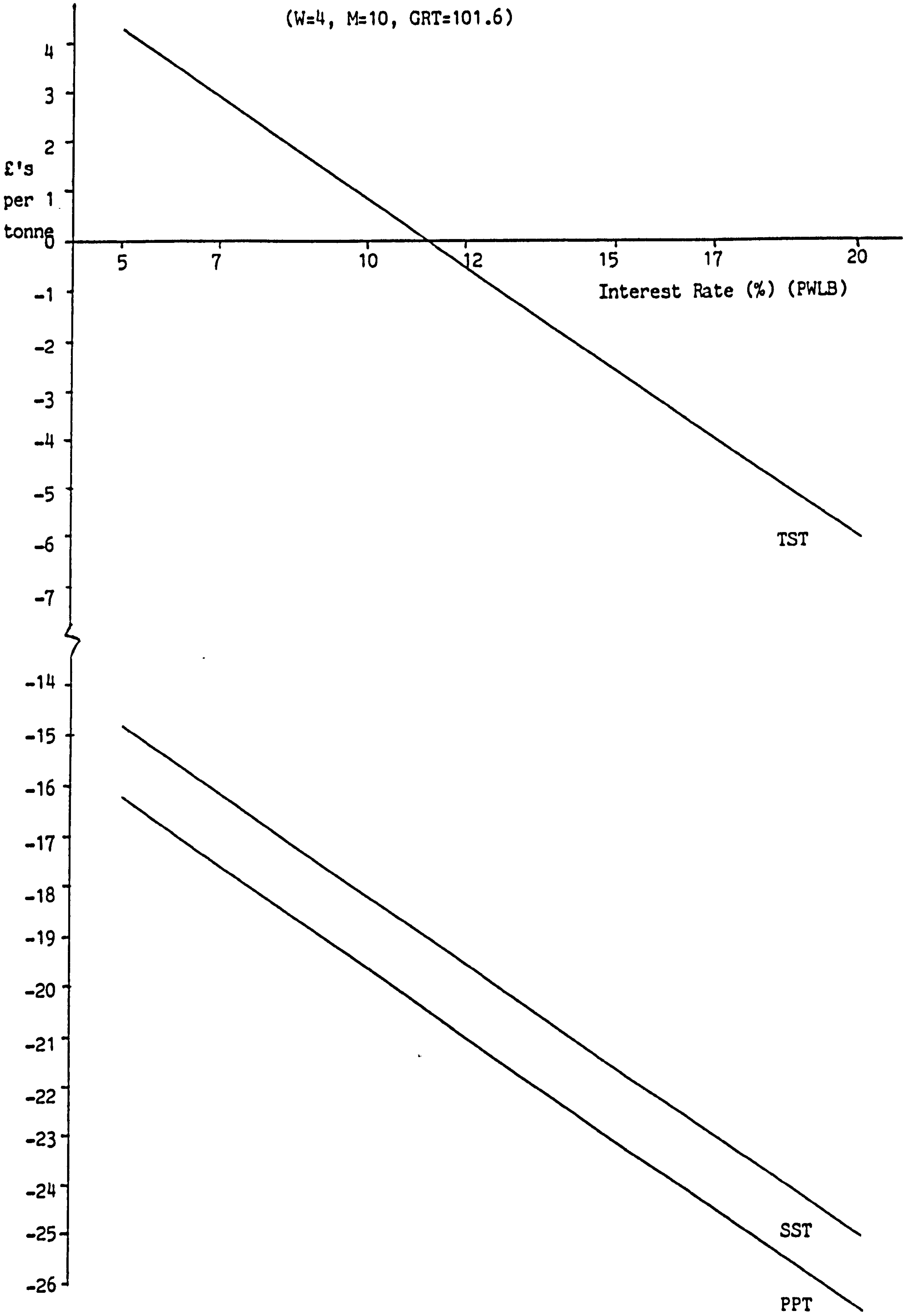
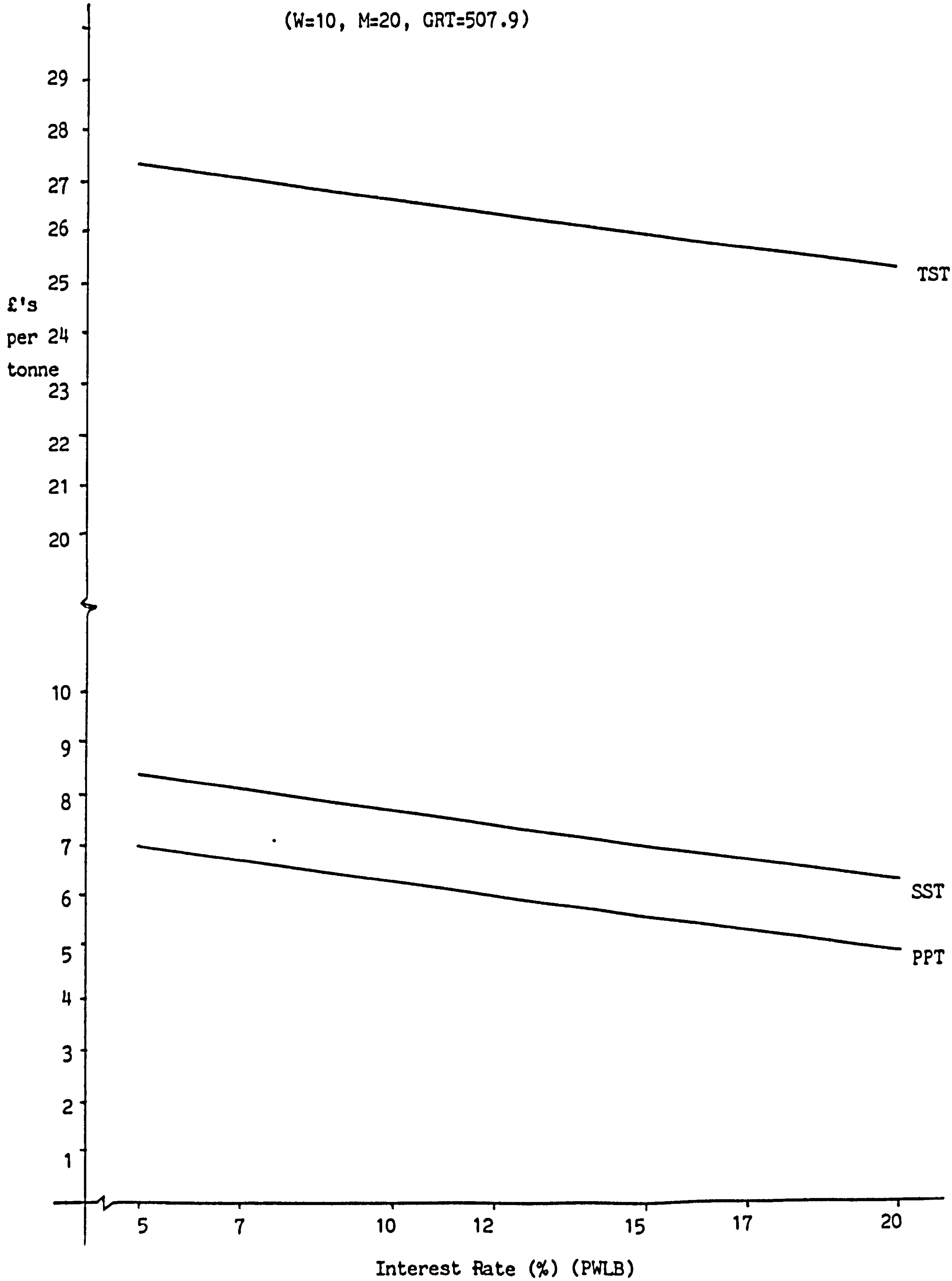


FIGURE F6.4d Effects Of Changes In Interest Rates (PWLB) On Viability Measures (PPT, SST, TST)

(W=10, M=20, GRT=507.9)



F.6.5 Effect Of Changes On Interest Rates (PWLB) On Profit/Loss Breakeven Boundary (PPT)

INTEREST RATE PWLB	WASTE GENERATION W (Kilogrammes Per Household Per Week) 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
5	90/91	45/46	30/31	22/23	18/19	15/16	12/13	11/12	10/11	9/10	8/9
7	95/96	47/48	31/32	23/24	19/20	15/16	13/14	11/12	10/11	9/10	8/9
10	-	50/51	33/34	25/26	20/21	16/17	14/15	12/13	11/12	10/11	9/10
12	-	53/54	35/36	26/27	21/22	17/18	15/16	13/14	11/12	10/11	9/10
15	-	56/57	37/38	28/29	22/23	18/19	16/17	14/15	12/13	11/12	10/11
17	-	58/59	38/39	29/30	23/24	19/20	16/17	14/15	12/13	11/12	10/11
20	-	61/62	41/42	30/31	24/25	20/21	17/18	15/16	13/14	12/13	11/12

FIGURE F6.5a Effect Of Changes On Interest Rate (PWLB) On Profit/Loss Breakeven Boundary (PPT)

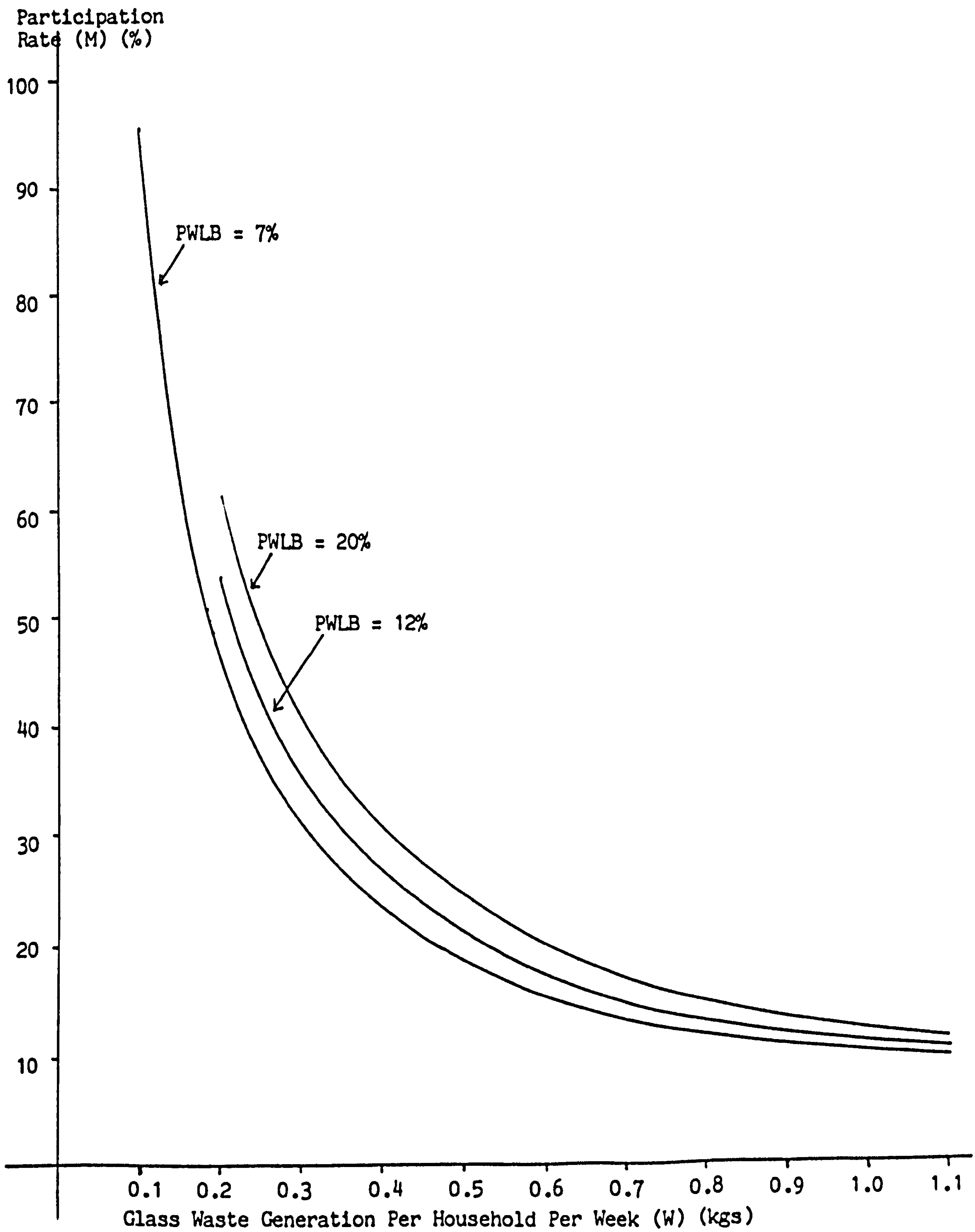


TABLE F.6.6 Effects Of Changes In Proportion Of Storage Costs (STC) Met By The Bottle Bank System On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Proportion Of Storage Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	STC	PPT	SST	TST
10	10	254	0*STC	0.59	2.01	21.01
			0.2*STC	0.43	1.85	20.85
			0.4*STC	0.26	1.68	20.68
			0.6*STC	0.10	1.52	20.52
			0.8*STC	-0.07	1.35	20.35
			1.0*STC	-0.23	1.19	20.19
W	M	GRT	STC	PPT	SST	TST
4	10	101.6	0*STC	-17.57	-16.15	2.85
			0.2*STC	-17.98	-16.56	2.44
			0.4*STC	-18.39	-16.97	2.03
			0.6*STC	-18.80	-17.38	1.62
			0.8*STC	-19.21	-17.79	1.21
			1.0*STC	-19.21	-17.79	0.81
W	M	GRT	STC	PPT	SST	TST
4	20	203.2	0*STC	-2.44	-1.02	17.98
			0.2*STC	-2.64	-1.22	17.78
			0.4*STC	-2.85	-1.43	17.57
			0.6*STC	-3.05	-1.63	17.37
			0.8*STC	-3.26	-1.84	17.16
			1.0*STC	-3.46	-2.04	16.96
W	M	GRT	STC	PPT	SST	TST
10	20	507.9	0*STC	6.64	8.06	27.06
			0.2*STC	6.56	7.98	26.98
			0.4*STC	6.48	7.90	26.90
			0.6*STC	6.40	7.82	26.82
			0.8*STC	6.31	7.73	26.73
			1.0*STC	6.23	7.65	26.65

FIGURE F6.6a Effects Of Changes In Storage Costs (STC) Met By Bottle Bank System On Viability Measures (PPT,SST,TST)

(W=10, M=10, GRT=254)

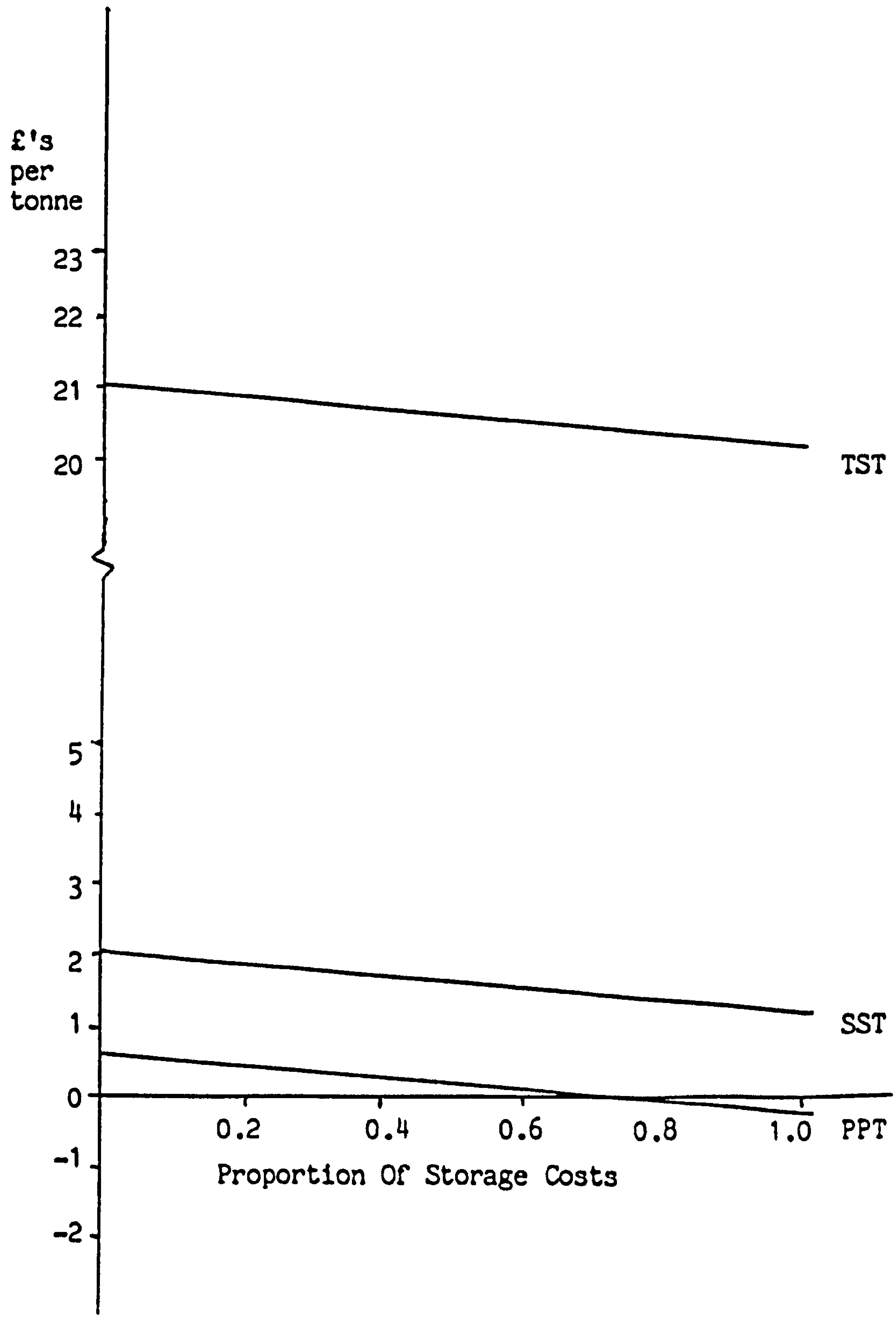


FIGURE F6.6b Effects Of Changes In Storage Costs (STC) Met By The Bottle Bank System On Viability Measures (PPT,SST,TST)

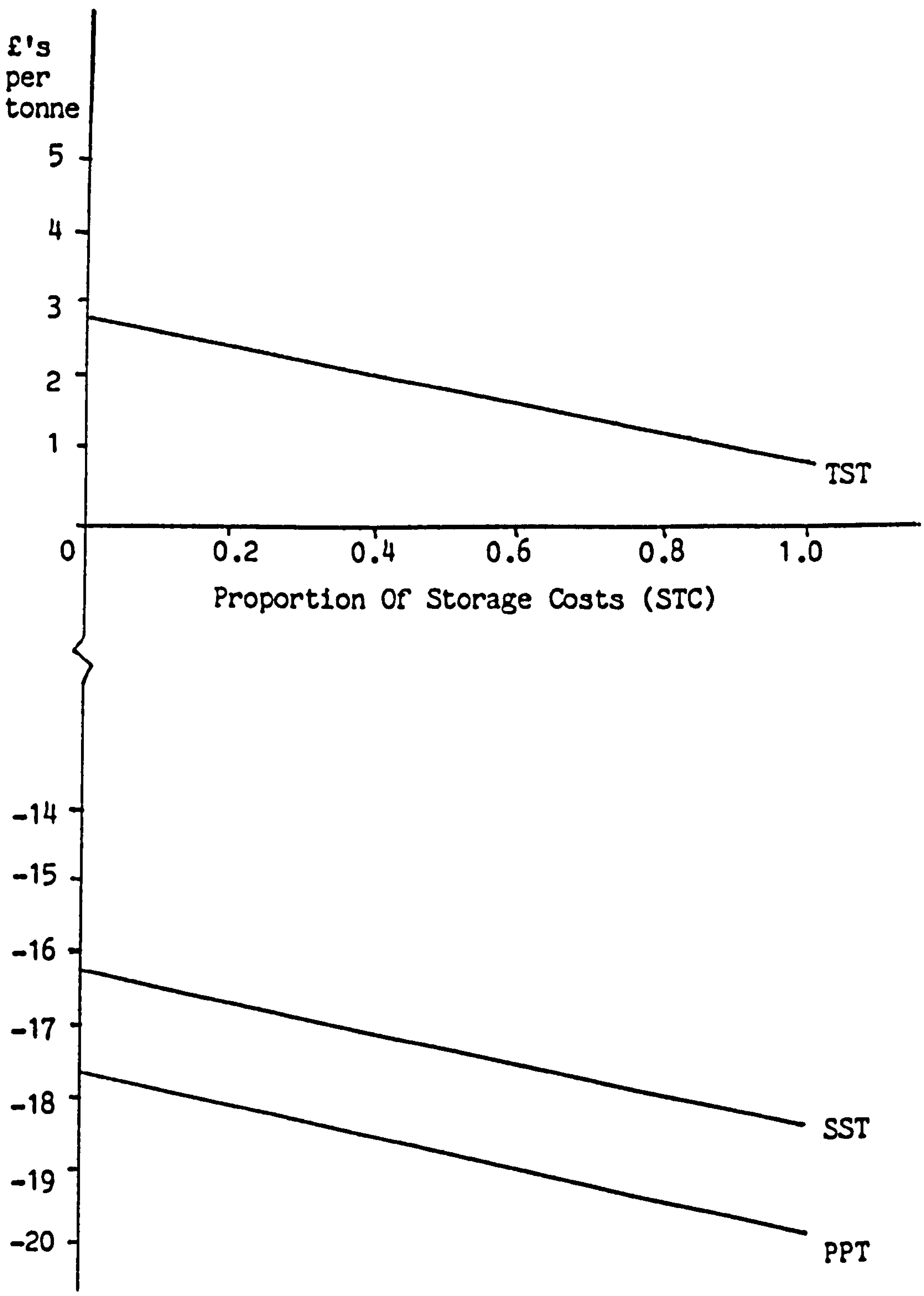


FIGURE F6.6c Effects Of Changes In The Proportion Of Storage Costs (STC) Met By The Bottle Bank System On Viability Measures (PPT, SST, TST)

(W=10, M=20, GRT=507.9)

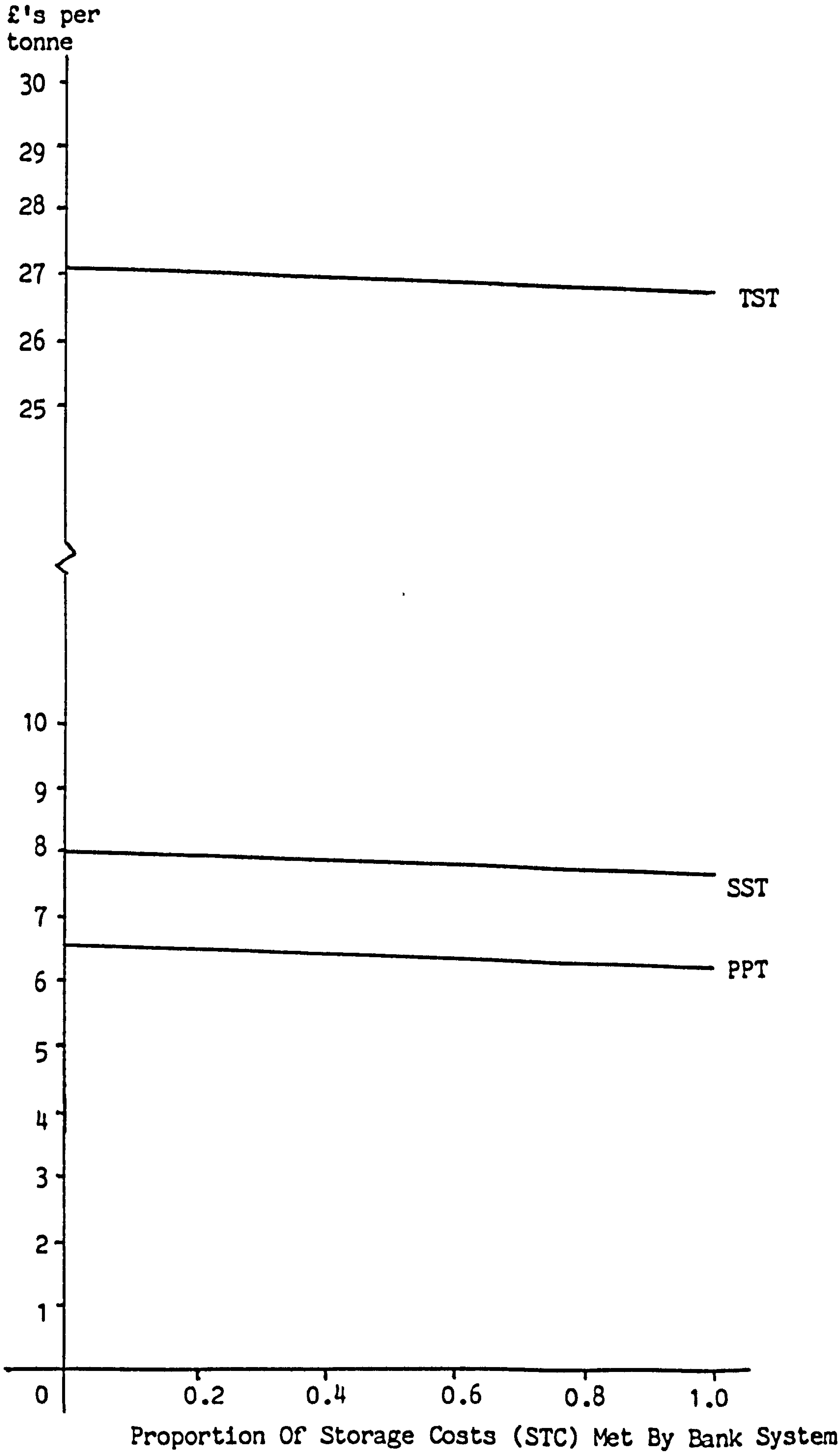
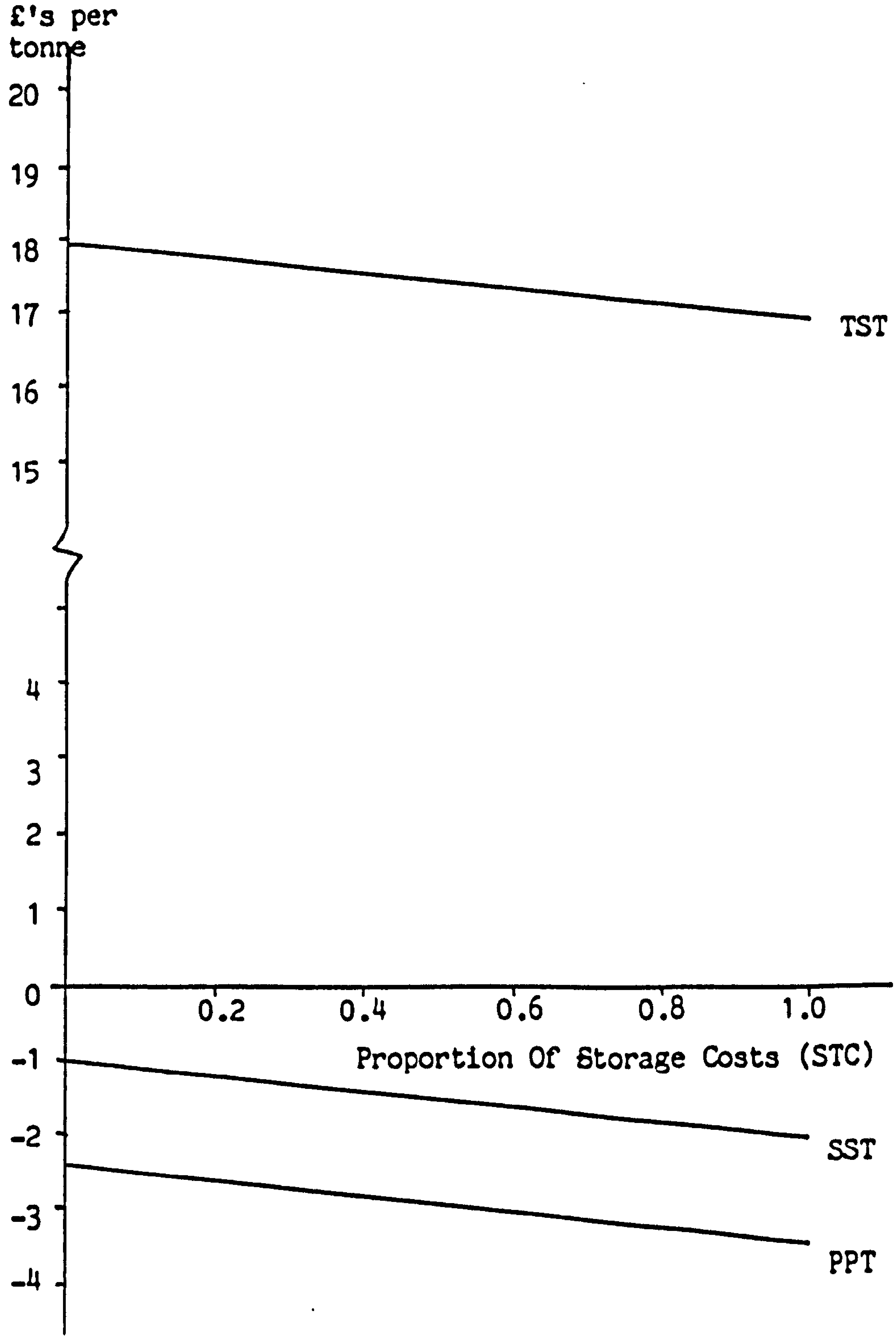


FIGURE F6.6d Effects Of Change In Storage Costs (STC) Met By The Bottle Bank System On The Viability Measures (PPT, SST, TST)

(W=4, M=20, GRT=203.2)



F.6.7 Effects Of Changes In Proportion Of Storage Costs (STC) Met By The Bottle Bank System On Profit/Loss Breakeven Boundary (PPT)

PROPORTION OF STORAGE COSTS STC	WASTE GENERATION W (Kilogrammes Per Household Per Week) 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
0.0	95/96	47/48	31/32	23/24	19/20	15/16	13/14	11/12	10/11	9/10	8/9
0.2	96/97	48/49	32/33	24/25	19/20	16/17	13/14	12/13	10/11	9/10	8/9
0.4	97/98	48/49	32/33	24/25	19/20	16/17	13/14	12/13	10/11	9/10	8/9
0.6	99/100	49/50	33/34	24/25	19/20	17/18	14/15	12/13	11/12	9/10	8/9
0.8	-	50/51	33/34	25/26	20/21	16/17	14/15	12/13	11/12	10/11	9/10
1.0	-	50/51	33/34	25/26	20/21	16/17	14/15	12/13	11/12	10/11	9/10

FIGURE F6.7a Effects Of Changes In Proportion Of Storage Costs (STC) Met By The Bottle Bank System On Viability Measures (PPT)

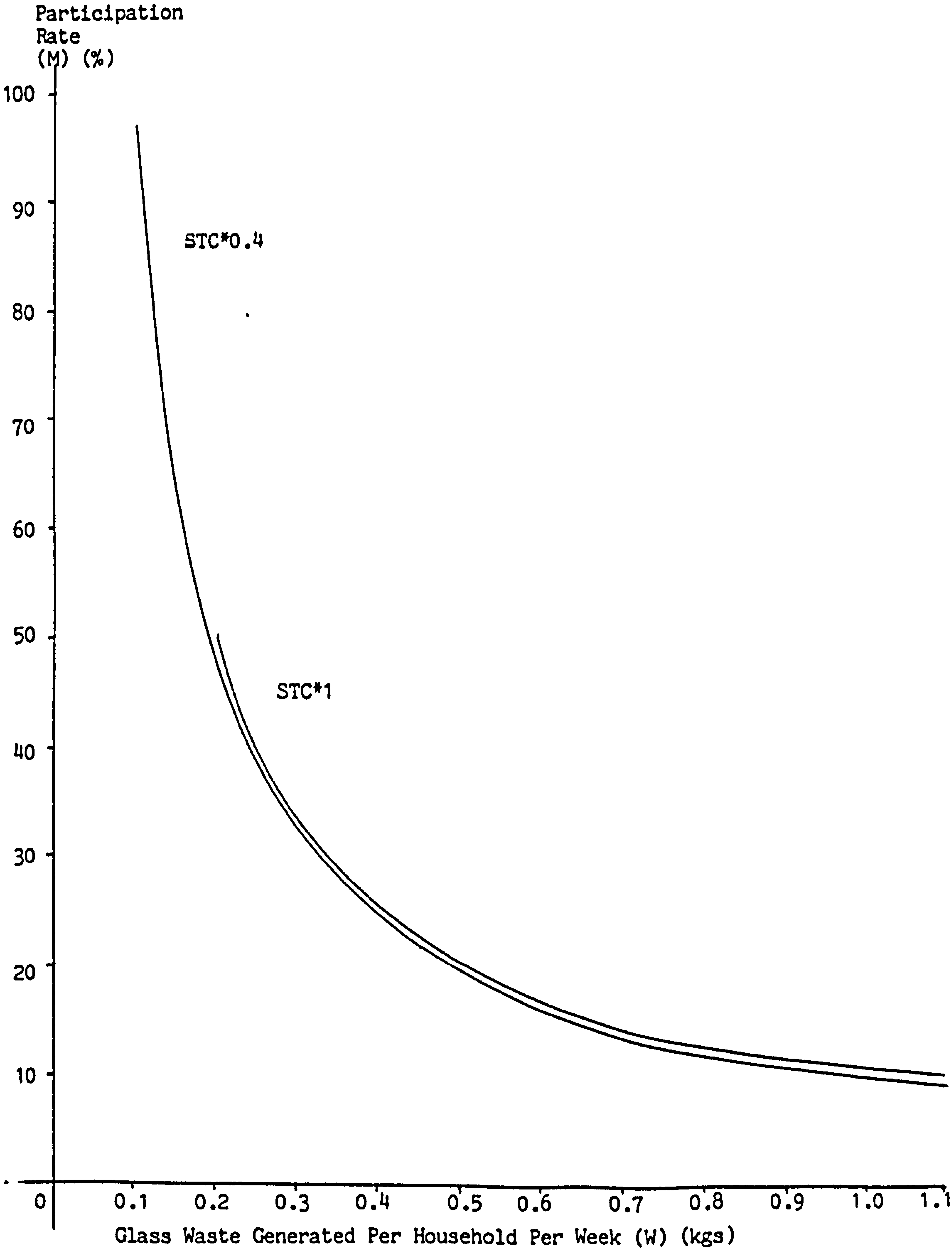


TABLE F.6.8 Effects Of Changes On Filling Rate (D) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Capacity Of Banks	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	D	PPT	SST	TST
10	10	254	3.5	0.23	1.64	20.65
			3.0	-0.23	1.19	20.19
			2.5	-0.87	0.55	19.55
			2.0	-1.83	-0.41	18.59
			1.5	-3.44	-2.02	16.98
			1.0	-6.64	-5.22	13.78
			0.5	-16.26	-14.84	4.16
W	M	GRT	D	PPT	SST	TST
4	10	101.6	3.5	-19.96	-17.74	1.26
			3.0	-19.61	-18.19	0.81
			2.5	-20.26	-18.84	0.16
			2.0	-21.22	-19.80	-0.80
			1.5	-22.82	-21.40	-2.40
			1.0	-26.03	-24.61	-5.61
			0.5	-35.65	-34.23	-15.23
W	M	GRT	D	PPT	SST	TST
4	20	203.2	3.5	-3.00	-1.58	17.42
			3.0	-3.46	-2.04	16.96
			2.5	-4.10	-2.68	16.32
			2.0	-5.06	-3.64	15.36
			1.5	-6.67	-5.25	13.75
			1.0	-9.87	-8.45	10.55
			0.5	-19.49	-18.07	0.93
W	M	GRT	D	PPT	SST	TST
10	20	507.9	3.5	6.69	8.11	27.11
			3.0	6.23	7.65	26.65
			2.5	5.59	7.01	26.01
			2.0	4.63	6.05	25.05
			1.5	3.03	4.45	23.45
			1.0	-0.18	1.24	20.24
			0.5	-9.80	-8.38	10.62

FIGURE F6.8a Effect Of Changes On Tonnage Collected Per Bank (D) On The Viability Measures (PPT, SST, TST)

(W=10, M=20, GRT=507.9)

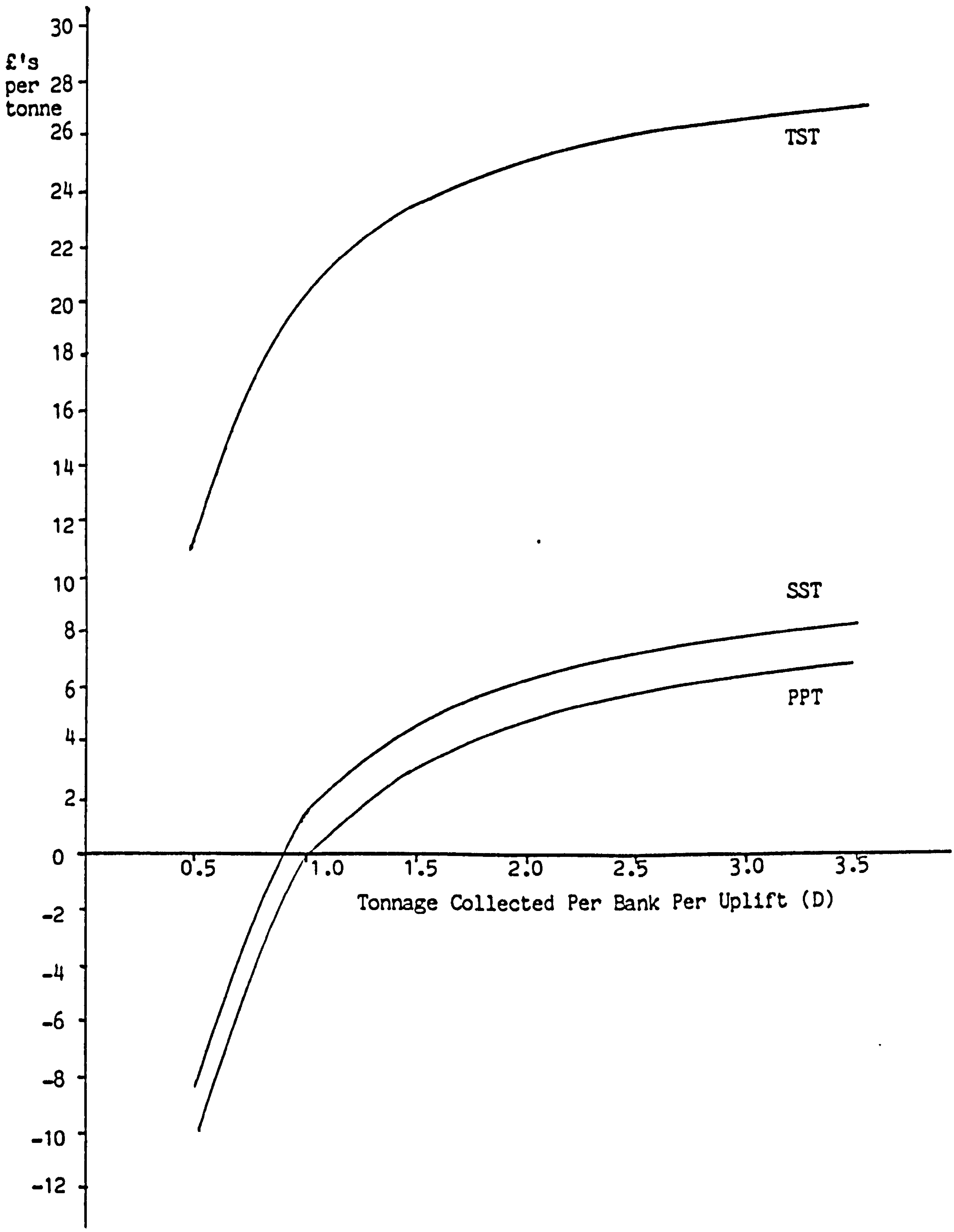


FIGURE F6.8b Effect Of Changes On Tonnage Collected Per Bank (D) On The Viability Measures (PPT, SST, TST)

(W=4, M=20, GRT=204.2)

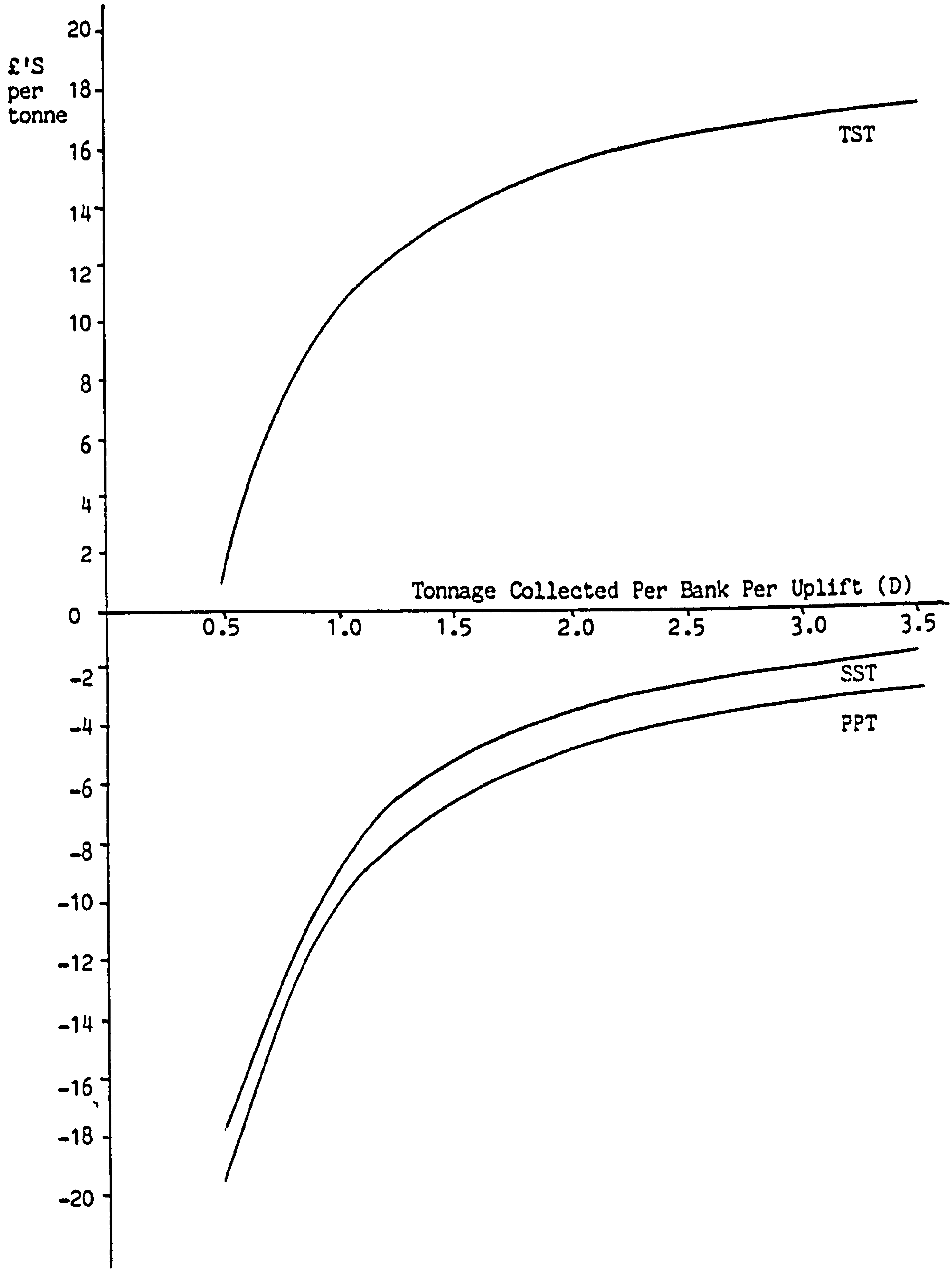


FIGURE F6 .8c Effect Of Changes On Tonnage Collected Per Bank (D) On The Viability Measures (PPT, SST, TST)

(W=10, M=10, GRT=254)

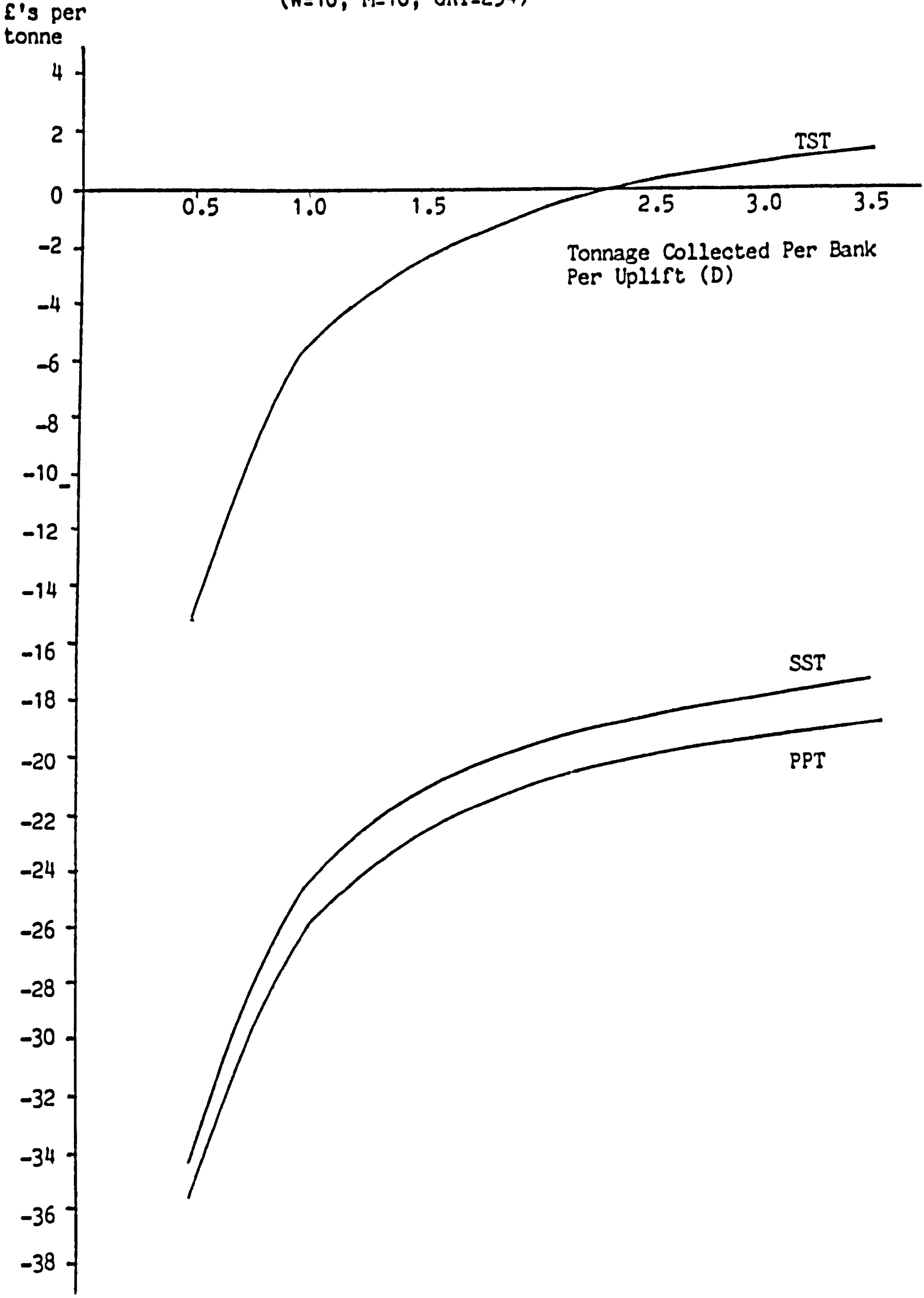
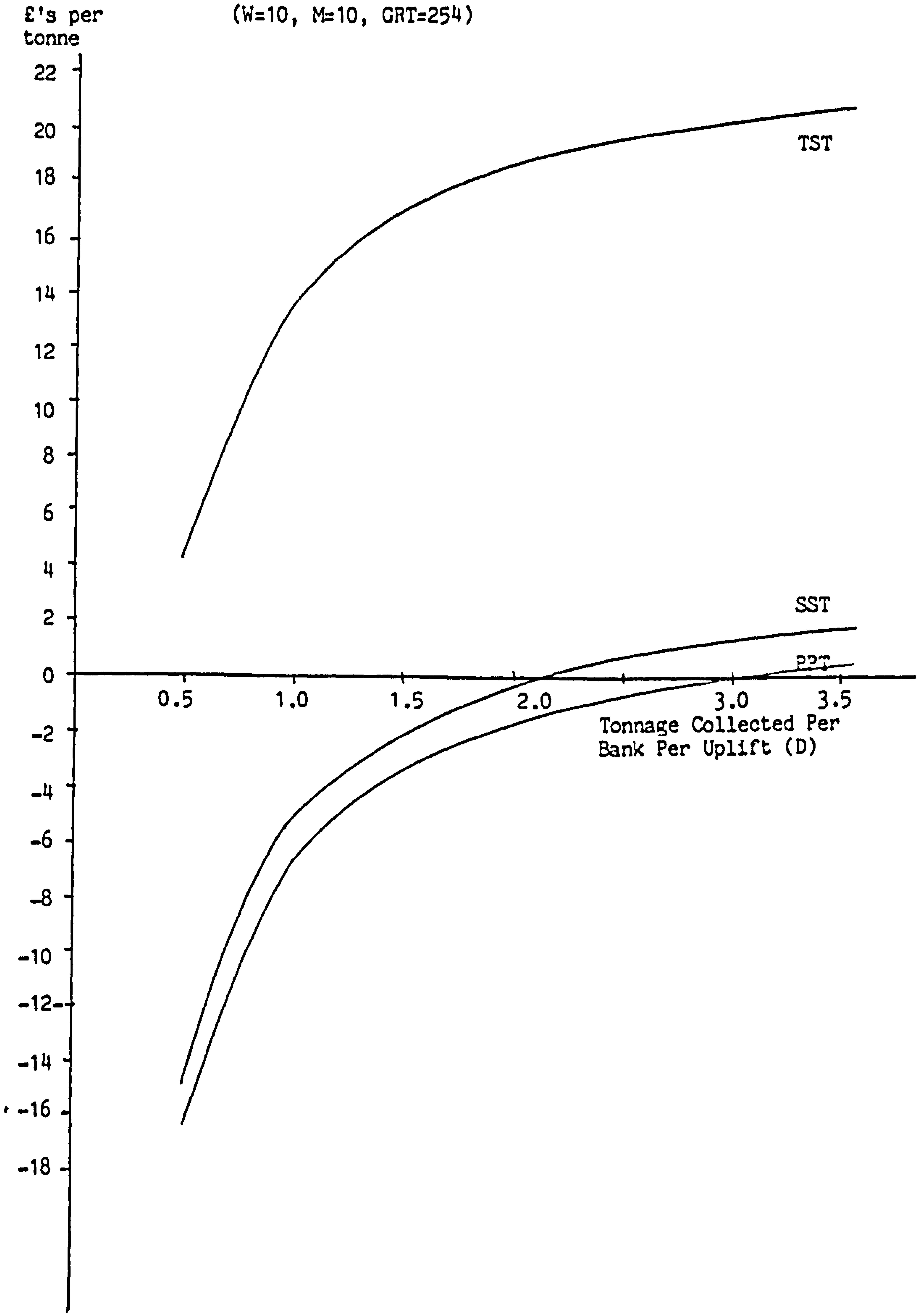


FIGURE F6.8d Effect Of Changes On Tonnage Collected Per Bank (D) On The Viability Measures (PPT,SST,TST)

(W=10, M=10, GRT=254)



F.6.9 Effects Of Changes Of Uplift Tonnage (D) On Profit/Loss Breakeven Boundary (PPT)

UPLIFT TONNAGE D	WASTE GENERATION W (Kilogrammes Per Household Per Week) 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
3.5	98/99	49/50	32/33	24/25	19/20	16/17	14/15	12/13	10/11	9/10	8/9
3.0	-	50/51	33/34	25/26	20/21	16/17	14/15	12/13	11/12	10/11	9/10
2.5	-	53/54	35/36	26/27	21/22	17/18	15/16	13/14	11/12	10/11	9/10
2.0	-	59/60	38/39	29/30	23/24	19/20	16/17	14/15	12/13	11/12	10/11
1.5	-	68/69	45/46	34/35	27/28	22/23	19/20	17/18	15/16	13/14	12/13
1.0	-	-	69/70	52/53	41/42	34/35	29/30	25/26	22/23	20/21	18/19
0.5	-	-	-	-	-	-	-	-	-	-	-

FIGURE F6 .9a Effect Of Changes Of Uplift Tonnage (D) Per Bank On Profit/Loss (PPT) Breakeven Boundary

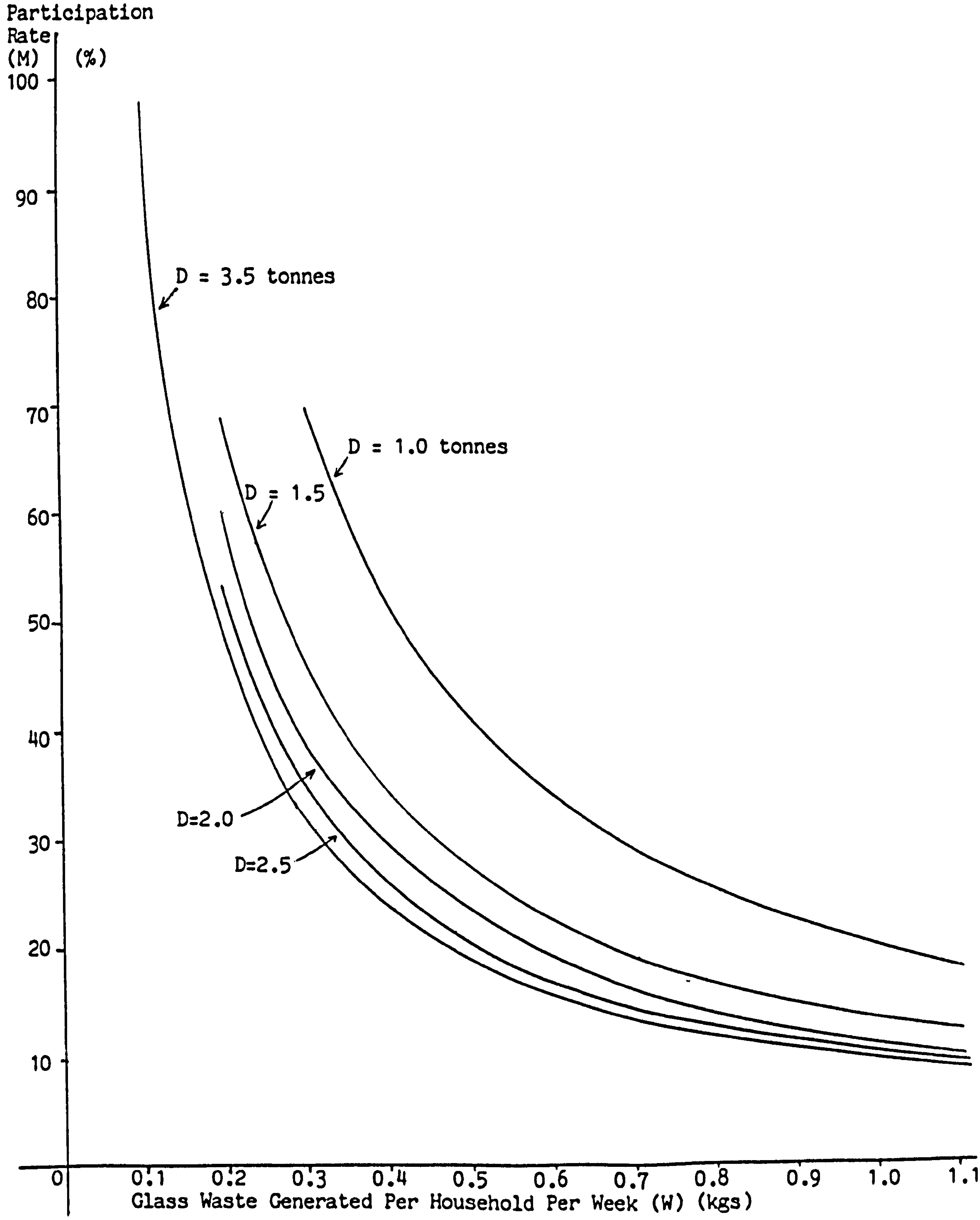


TABLE F.6.10 Effects Of Changes On Collection Costs (H) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Collectn Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	H	PPT	SST	TST
10	10	254	1.00	2.59	4.01	23.01
			2.00	2.26	3.68	22.68
			3.00	1.93	3.35	22.35
			4.00	1.59	3.01	22.01
			5.00	1.26	2.68	21.68
			6.00	-	-	-
			7.00	0.59	2.01	21.01
			8.00	0.26	1.68	20.68
			9.00	-	-	-
			9.47	-	-	-
			10.00	-0.41	1.01	20.01
			11.00	-0.74	0.68	19.68
			12.00	-	-	-
			13.00	-1.41	0.01	19.01
			14.00	-	-	-
			15.00	-2.07	-0.65	18.35
W	M	GRT	H	PPT	SST	TST
4	10	101.6	1.00	-16.79	-15.37	3.63
			2.00	-17.12	-15.70	3.30
			3.00	-17.46	-16.04	2.96
			4.00	-17.79	-16.37	2.63
			5.00	-18.12	-16.70	2.30
			6.00	-	-	-
			7.00	-18.79	-17.37	1.63
			8.00	-19.12	-17.70	1.30
			9.00	-	-	-
			9.47	-	-	-
			10.00	-19.79	-18.37	0.63
			11.00	-20.12	-18.70	0.30
			12.00	-	-	-
			13.00	-20.79	-19.37	-0.37
			14.00	-	-	-
			15.00	-21.46	-20.04	-1.04

TABLE F.6.10 Effects Of Changes On Collection Costs (D)
(Continued) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Collectn Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	H	PPT	SST	TST
4	20	203.2	1.00	-0.64	0.78	19.78
			2.00	-0.97	0.45	19.45
			3.00	-1.30	0.12	19.12
			4.00	-1.64	-0.22	18.78
			5.00	-1.97	-0.55	18.45
			6.00	-	-	-
			7.00	-2.64	-1.22	17.78
			8.00	-2.97	-1.55	17.45
			9.00	-	-	-
			9.47	-	-	-
			10.00	-3.64	-2.22	16.78
			11.00	-3.97	-2.55	16.45
			12.00	-	-	-
			13.00	-4.64	-3.22	15.78
			14.00	-	-	-
			15.00	-5.30	-3.88	15.12
W	M	GRT	H	PPT	SST	TST
10	20	507.9	1.00	9.06	10.48	29.48
			2.00	8.72	10.14	29.14
			3.00	8.39	9.81	28.81
			4.00	8.06	9.48	28.48
			5.00	7.72	9.14	28.14
			6.00	-	-	-
			7.00	7.06	8.48	27.48
			8.00	6.72	8.14	27.14
			9.00	-	-	-
			9.47	-	-	-
			10.00	6.06	7.48	26.48
			11.00	5.72	7.14	26.14
			12.00	-	-	-
			13.00	5.06	6.48	25.48
			14.00	-	-	-
			15.00	4.39	5.81	24.81

FIGURE F6.10a Effects Of Changes In Collection Costs (H) On Viability Measures (PPT, SST, TST)

(W=4, M=10, GRT=101.6)

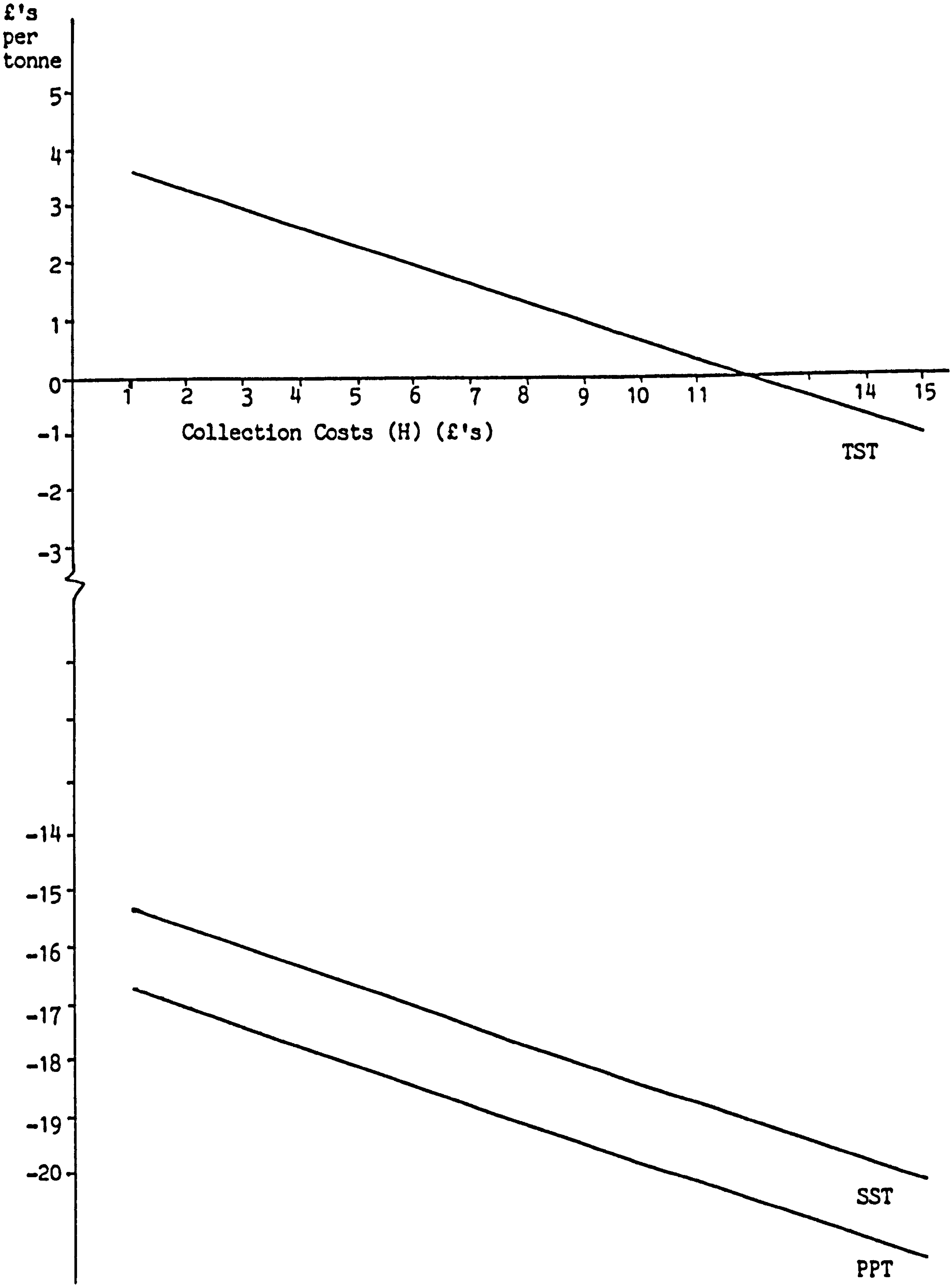


FIGURE F6 .10b Effects Of Changes In Collection Costs (H) On Viability Measures (PPT, SST, TST)

(W=10, M=10, GRT=254)

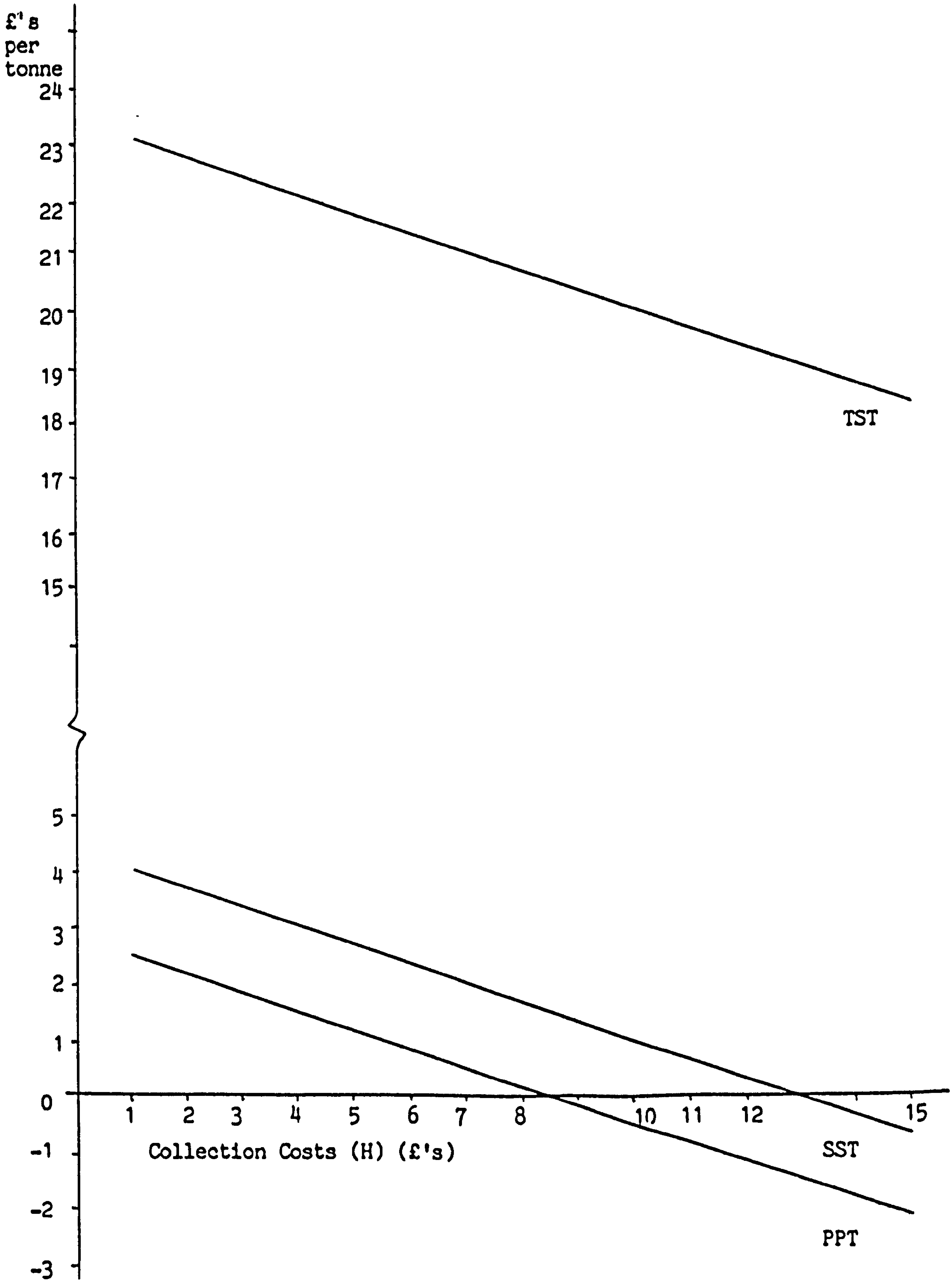


FIGURE F6.10c Effects Of Changes In Collection Costs (H) On Viability Measures (PPT, SST, TST)

(W=10, M=20, GRT=507.9)

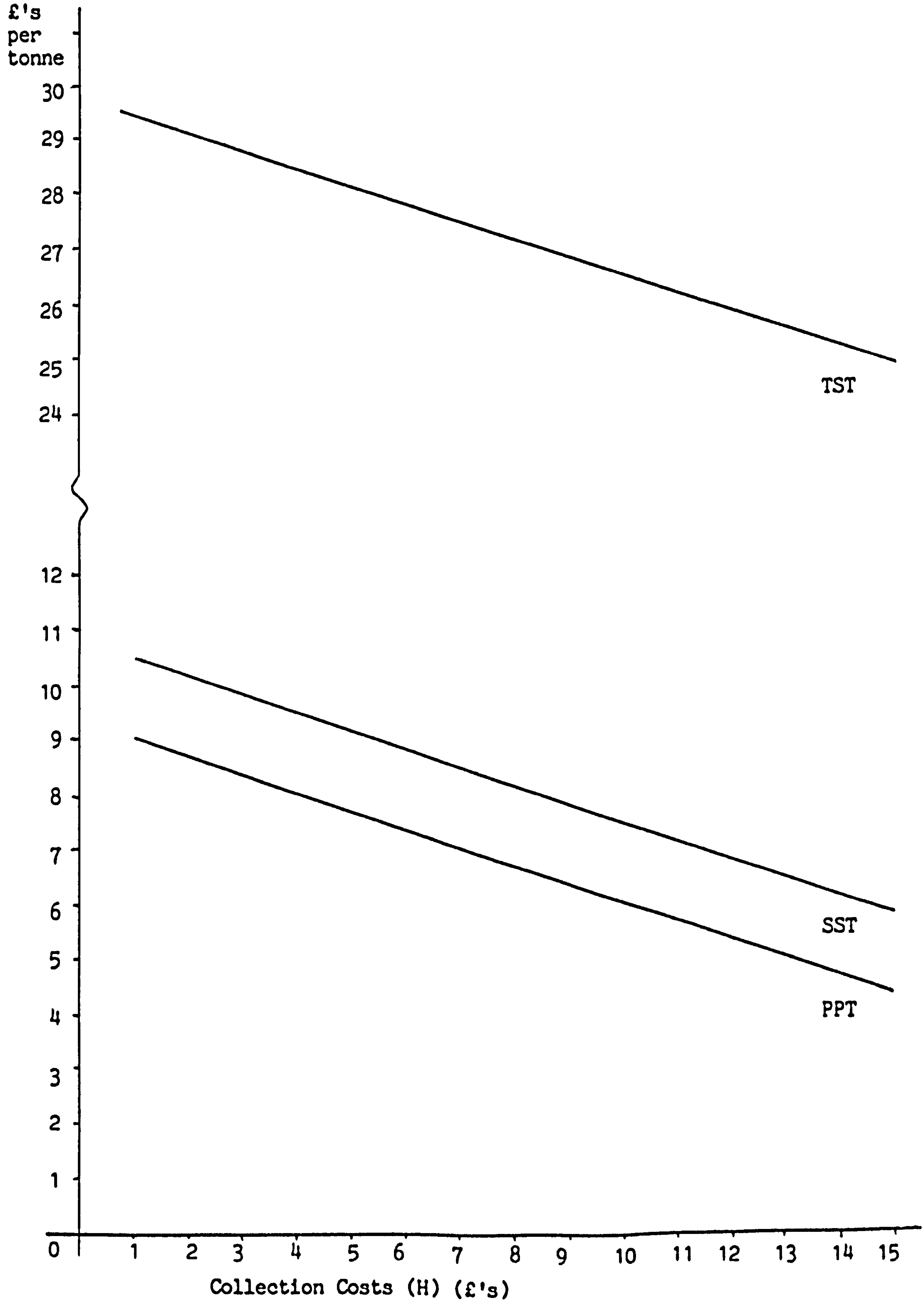
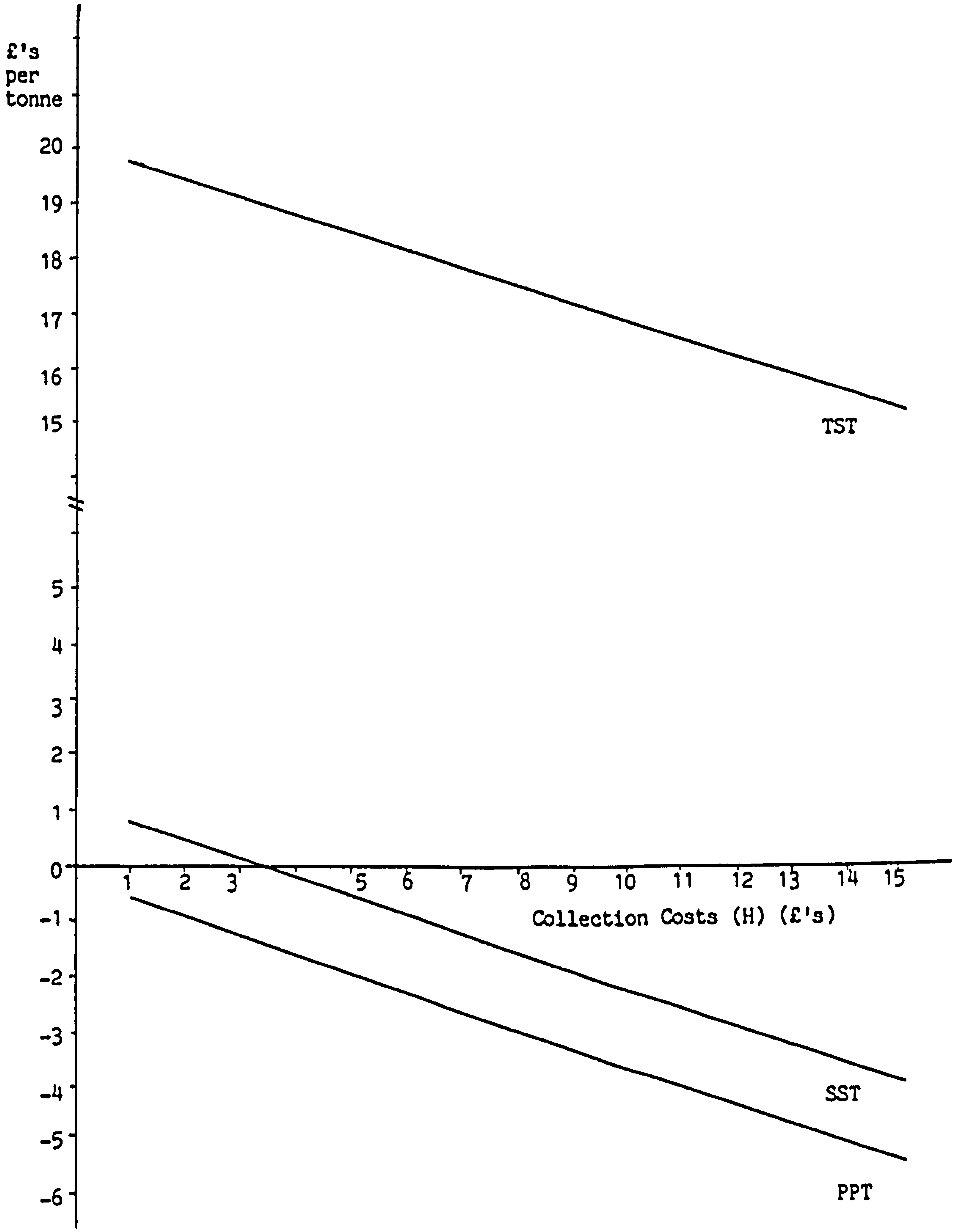


FIGURE F6.10d Effects Of Changes Of Collection Costs (H) On The Viability Measures (PPT, SST, TST)
(W=4, M=20, GRT=203.2)



F.6.11 Effects Of Changes Of Collection Costs (H) On Profit/Loss Breakeven Boundary (PPT)

COLLECTION COST H	WASTE GENERATION W (Kilogrammes Per Household Per Week) 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
1.00	-	41/42	27/28	20/21	16/17	13/14	11/12	10/11	9/10	8/9	7/8
2.00	-	42/43	28/29	21/22	17/18	14/15	12/13	10/11	9/10	8/9	7/8
3.00	-	43/44	28/29	21/22	17/18	14/15	12/13	10/11	9/10	8/9	7/8
4.00	-	44/45	29/30	22/23	17/18	14/15	12/13	11/12	9/10	8/9	8/9
5.00	-	45/46	30/31	22/23	18/19	15/16	13/14	11/12	10/11	9/10	8/9
6.00	-	-	-	-	-	-	-	-	-	-	-
7.00		47/48	31/32	23/24	19/20	15/16	13/14	11/12	10/11	9/10	8/9
8.00	-	48/49	32/33	24/25	19/20	16/17	13/14	12/13	10/11	9/10	8/9
9.00	-	-	-	-	-	-	-	-	-	-	-
9.47	-	-	-	-	-	-	-	-	-	-	-
10.00	-	-	34/35	25/26	20/21	17/18	14/15	12/13	11/12	10/11	9/10
11.00	-	-	35/36	26/27	21/22	17/18	15/16	13/14	11/12	10/11	9/10
12.00	-	-	-	-	-	-	-	-	-	-	-
13.00	-	-	37/38	28/29	22/23	18/19	16/17	14/15	12/13	11/12	10/11
14.00	-	-	-	-	-	-	-	-	-	-	-
15.00	-	-	39/40	29/30	23/24	19/20	17/18	14/15	13/14	11/12	10/11

TABLE F.6.12 Effects Of Changes On Bulk Transport Costs (TR) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Bulk Transport Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	TR	PPT	SST	TST
10	10	254	0.50	3.27	4.69	23.69
			1.00	2.77	4.19	23.19
			2.00	1.77	3.19	22.19
			3.00	0.77	2.19	21.19
			4.00	-0.23	1.19	20.19
			5.00	-1.23	0.19	19.19
			6.00	-2.23	-0.81	18.19
			7.00	-3.23	-1.81	17.19
			8.00	-4.23	-2.81	16.19
			9.00	-5.23	-3.81	15.19
			10.00	-6.23	-4.81	14.19
W	M	GRT	TR	PPT	SST	TST
4	10	101.6	0.50	-16.11	-14.69	4.31
			1.00	-16.61	-15.19	3.81
			2.00	-17.61	-16.19	2.81
			3.00	-18.61	-17.19	1.81
			4.00	-19.61	-18.19	0.81
			5.00	-20.61	-19.19	-0.19
			6.00	-21.61	-20.19	-1.19
			7.00	-22.61	-21.19	-2.19
			8.00	-23.61	-22.19	-3.19
			9.00	-24.61	-23.19	-4.19
			10.00	-25.61	-24.19	-5.19

TABLE F.6.12 (Continued) Effects Of Changes On Bulk Transport Costs (TR) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Bulk Transport Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	TR	PPT	SST	TST
4	20	203.2	0.50	0.04	1.46	20.46
			1.00	-0.46	0.96	19.96
			2.00	-1.46	-0.04	18.96
			3.00	-2.46	-1.04	17.96
			4.00	-3.46	-2.04	16.96
			5.00	-4.46	-3.04	15.96
			6.00	-5.46	-4.04	14.96
			7.00	-6.46	-5.04	13.96
			8.00	-7.46	-6.04	12.96
			9.00	-8.46	-7.04	11.96
			10.00	-9.46	-8.04	10.96
W	M	GRT	TR	PPT	SST	TST
10	20	507.9	0.50	9.73	11.15	30.15
			1.00	9.23	10.65	29.65
			2.00	8.23	9.65	28.65
			3.00	7.23	8.65	27.65
			4.00	6.23	7.65	26.65
			5.00	5.23	6.65	25.96
			6.00	4.23	5.65	24.65
			7.00	3.23	4.65	23.65
			8.00	2.23	3.65	22.65
			9.00	1.23	2.65	21.65
			10.00	0.23	1.65	20.65

FIGURE F6.12a Effects Of Changes In Bulk Transport Costs (TR) On Viability Measures (PPT, SST, TST)

(W=10, M=10, GRT=254)

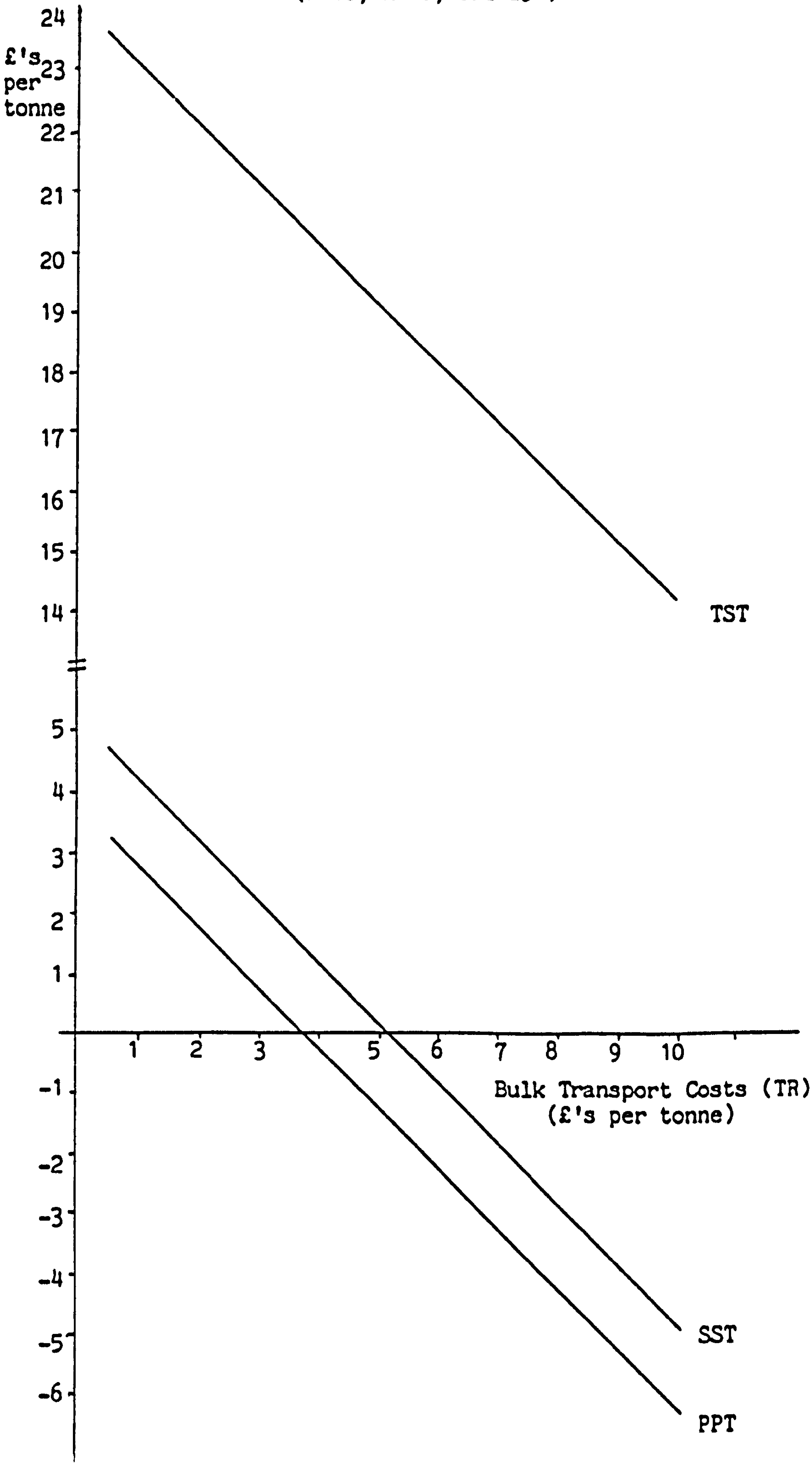


FIGURE F6.12d Effect Of Changes In Bulk Transport Costs (TR) On The Viability Measures (PPT, SST, TST)

(W=10, M=20, GRT=507.9)

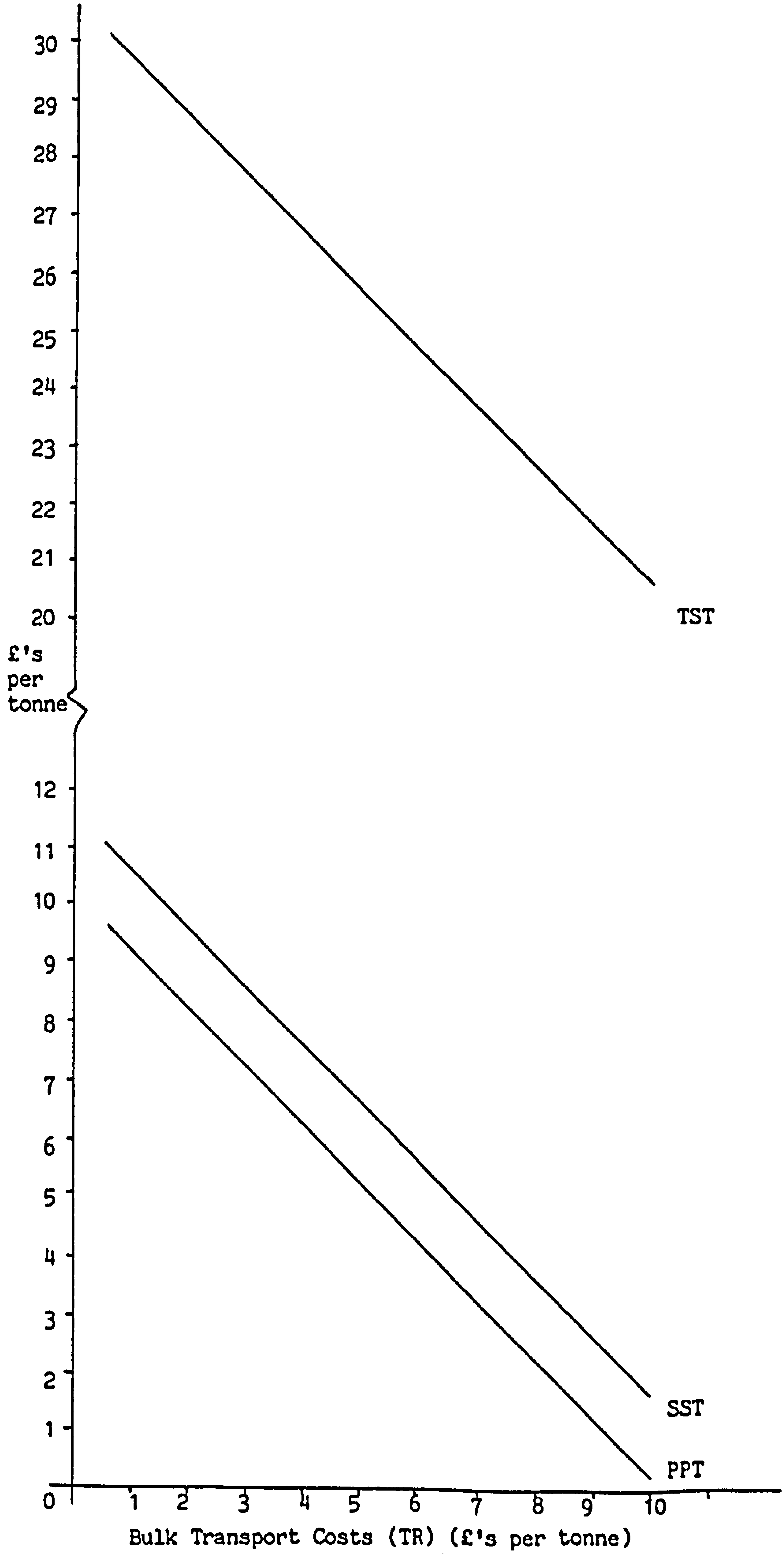


FIGURE F6.12b Effect Of Changes In Bulk Transport Costs (TR) On Viability Measures (PPT, SST, TST)

(W=4, M=10, GRT=101.6)

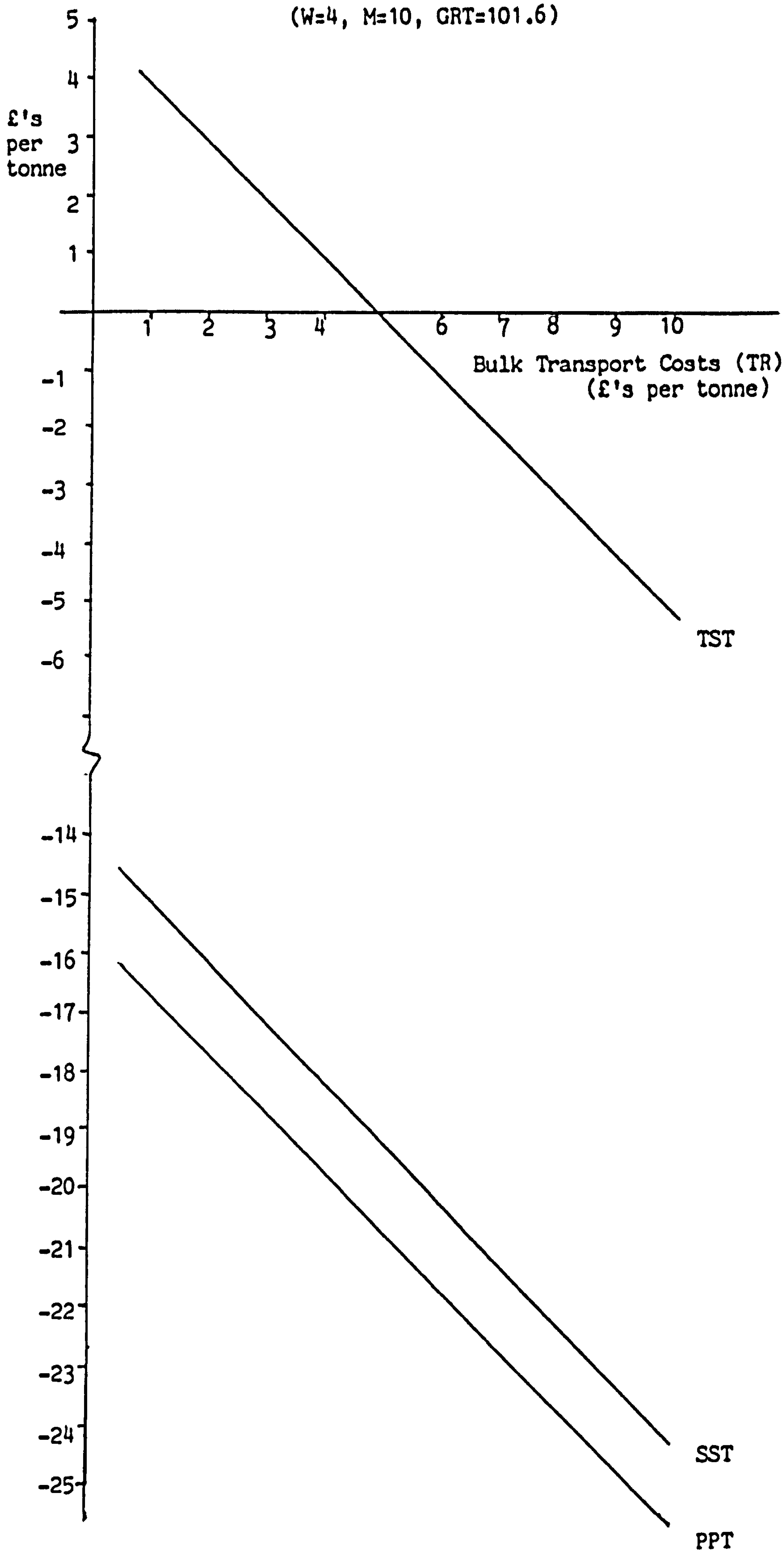
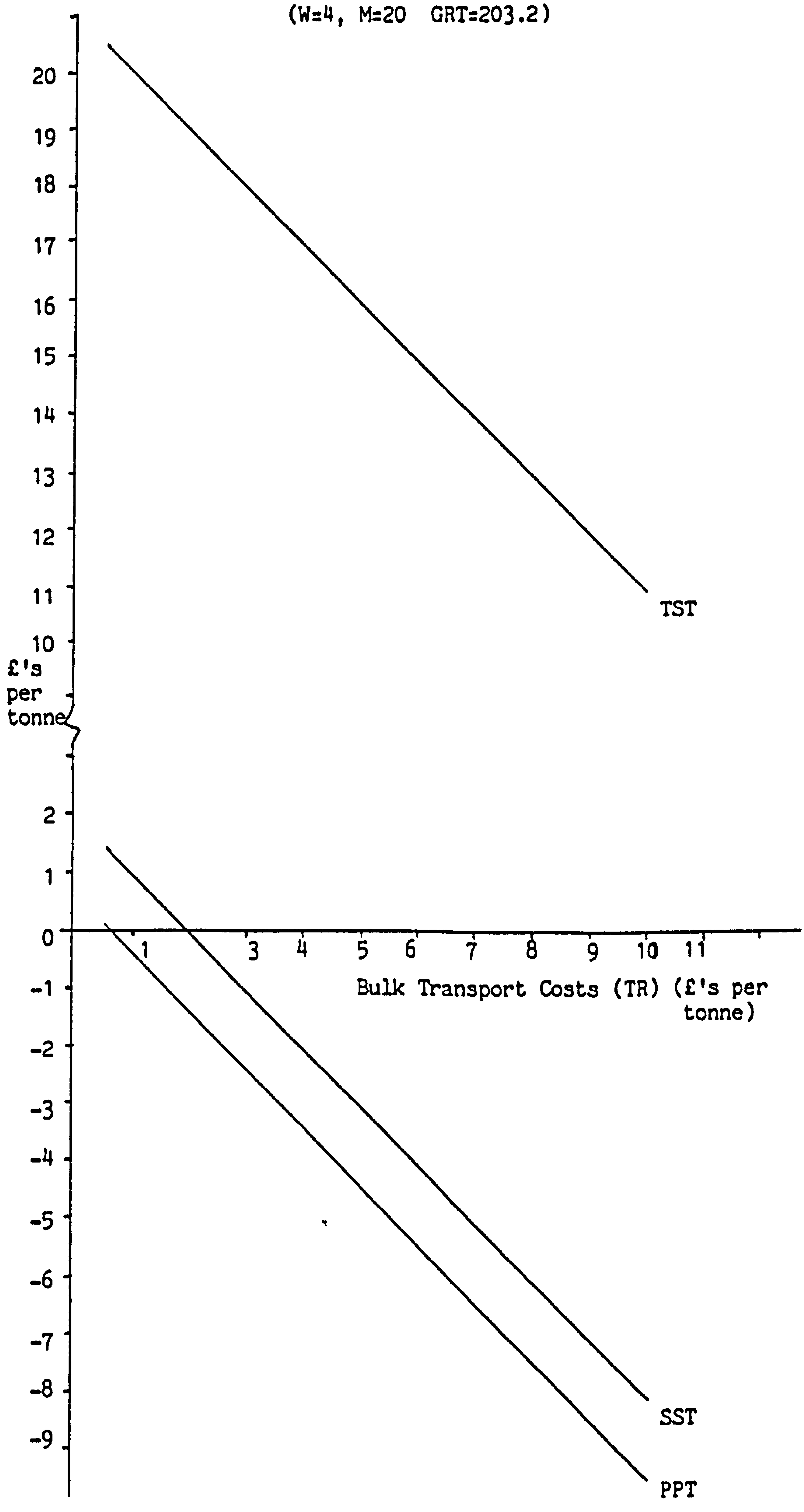


FIGURE F6.12c Effects Of Changes In Bulk Transport Costs (TR) On Viability Measures (PPT, SST, TST)

(W=4, M=20 GRT=203.2)



F.6.13 Effects Of Changes In Bulk Transport Costs (TR) On Profit/Loss Breakeven Boundary (PPT)

BULK TRANSPORT	WASTE GENERATION W (Kilogrammes Per Household Per Week)										
TR	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
0.5	79/80	39/40	26/27	19/20	15/16	13/14	11/12	9/10	8/9	7/8	7/8
1.0	82/83	41/42	27/28	20/21	16/17	13/14	11/12	10/11	9/10	8/9	7/8
2.0	87/88	43/44	29/30	21/22	17/18	14/15	12/13	10/11	9/10	8/9	7/8
3.0	94/95	47/48	31/32	23/24	18/19	15/16	13/14	11/12	10/11	9/10	8/9
4.0	-	50/51	33/34	25/26	20/21	16/17	14/15	12/13	11/12	10/11	9/10
5.0	-	55/56	36/37	27/28	22/23	18/19	15/16	13/14	12/13	11/12	10/11
6.0	-	60/61	40/41	30/31	24/25	20/21	17/18	15/16	13/14	13/13	10/11
7.0	-	66/67	44/45	33/34	26/27	22/23	19/20	16/17	14/15	13/14	12/13
8.0	-	74/75	49/50	37/38	29/30	24/25	21/22	18/19	16/17	14/15	13/14
9.0	-	83/84	55/56	41/42	33/34	27/28	23/24	20/21	18/19	16/17	15/16
10.0	-	96/97	64/65	48/49	38/39	32/33	27/28	24/25	21/22	19/20	17/18

TABLE F.6.14 Effects Of Changes On Skip Maintenance Costs (SKM) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Skip Mntenance Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	SKM	PPT	SST	TST
10	10	254	0	2.29	3.71	22.71
			20	1.66	3.08	22.08
			40	1.03	2.45	21.45
			60	0.40	1.82	20.82
			80	-0.23	1.19	20.19
			100	-0.86	0.56	19.56
W	M	GRT	SKM	PPT	SST	TST
4	10	101.6	0	-13.31	-11.89	7.11
			20	-14.89	-13.47	5.53
			40	-16.46	-15.04	3.96
			60	-18.04	-16.62	2.38
			80	-19.61	-18.19	0.81
			100	-21.19	-19.77	-0.77
W	M	GRT	SKM	PPT	SST	TST
4	20	203.2	0	-0.31	1.11	20.11
			20	-1.10	0.32	19.32
			40	-1.89	-0.47	18.53
			60	-2.67	-1.25	17.75
			80	-3.46	-2.04	16.96
			100	-4.25	-2.83	16.17
W	M	GRT	SKM	PPT	SST	TST
10	20	507.9	0	7.49	8.91	27.91
			20	7.18	8.60	27.60
			40	6.86	8.28	27.28
			60	6.55	7.97	26.97
			80	6.23	7.65	26.65
			100	5.92	7.34	26.34

FIGURE F6.13a Effect Of Changes In Skip Maintenance Costs (SKC) On Viability Measures (PPT, SST, TST)

(W=10, M=10, GRT=254)

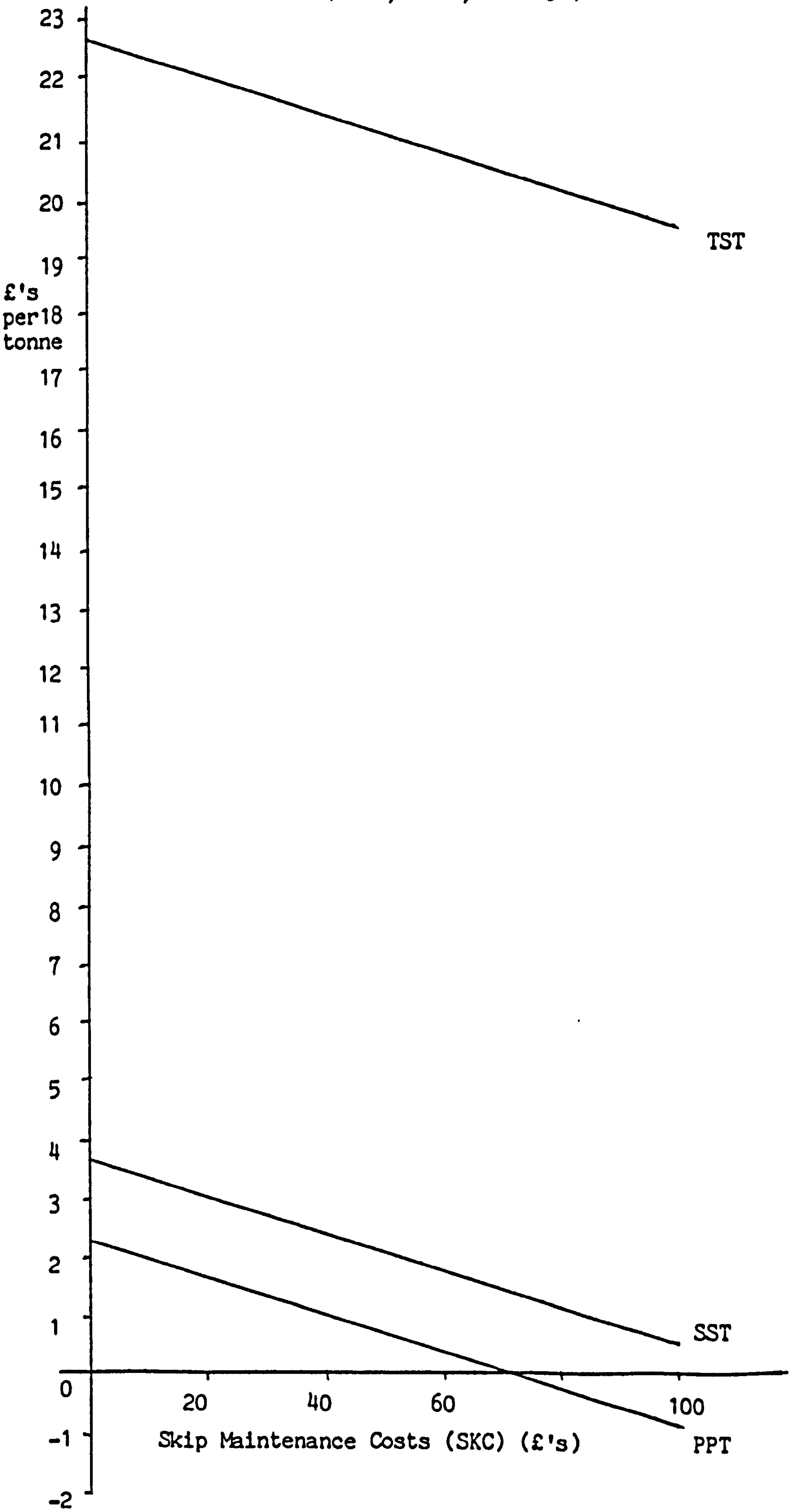


FIGURE F6.13b Effect Of Changes In Skip Maintenance Costs (SKC) On Viability Measures (PPT, SST, TST)

(W=4, M=10, GRT=101.6)

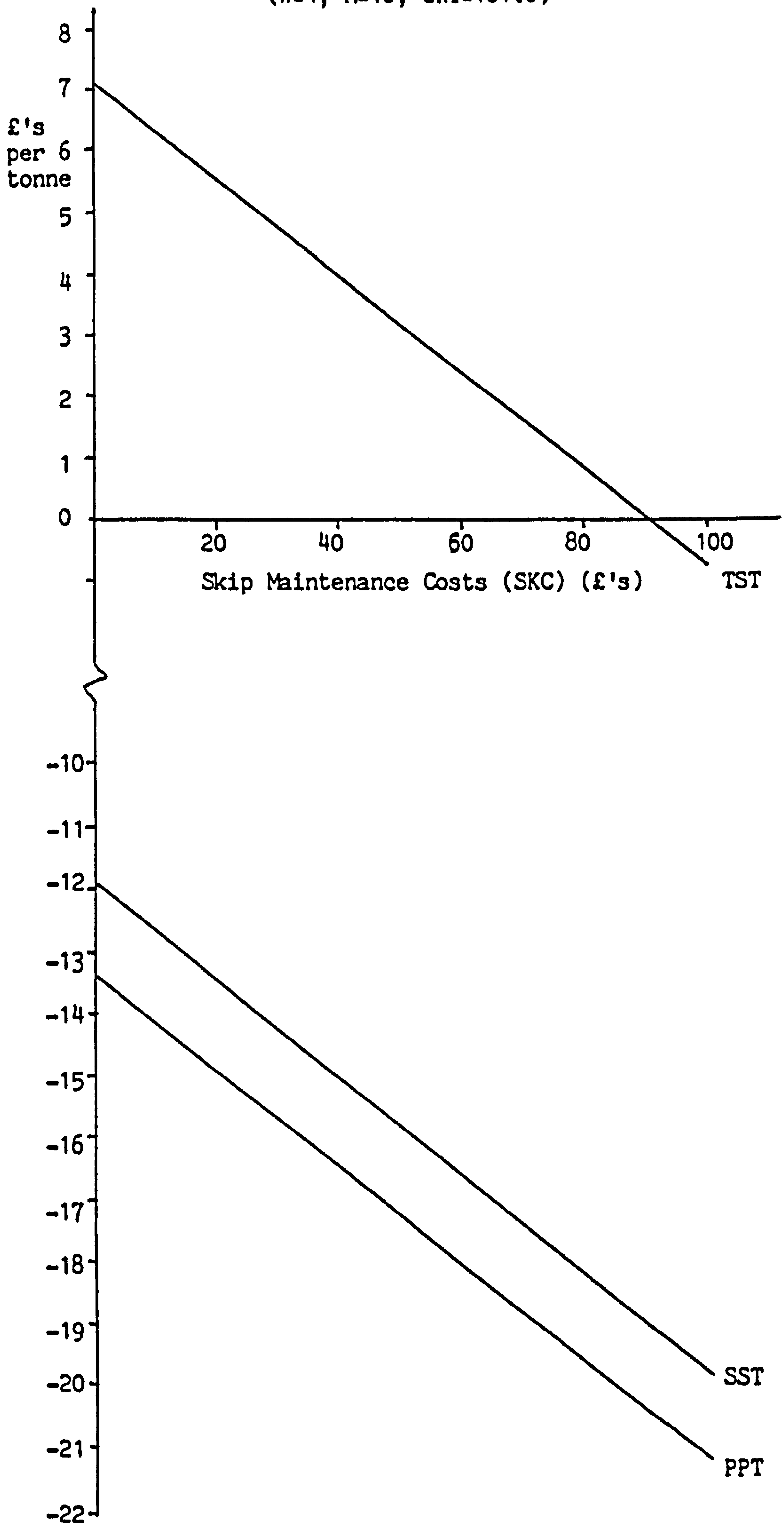


FIGURE F6 .13c Effects Of Changes On Skip Maintenance Costs (SKC) On Viability Measures (PPT, SST, TST)
(W=4, M=20, GRT=203.2)

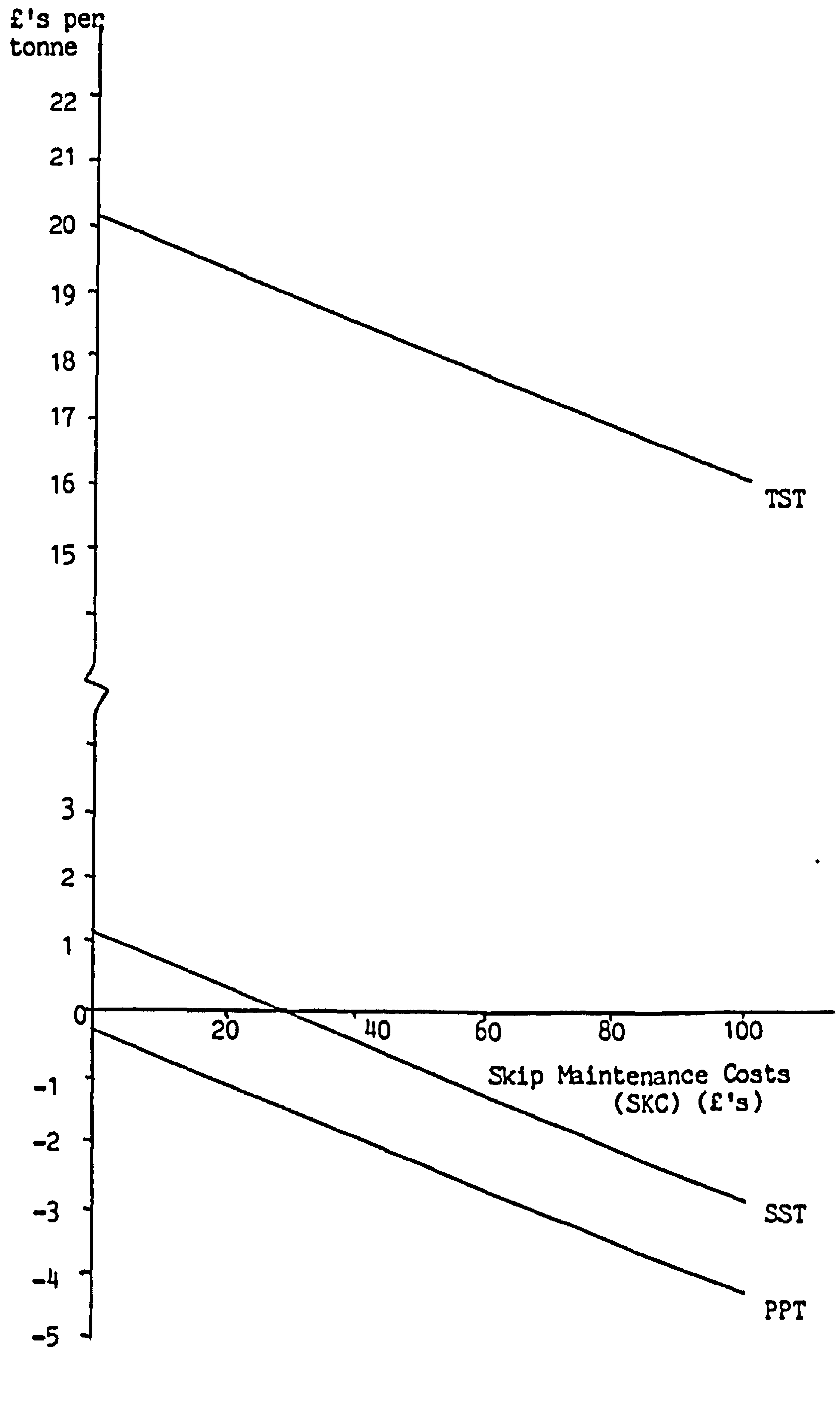
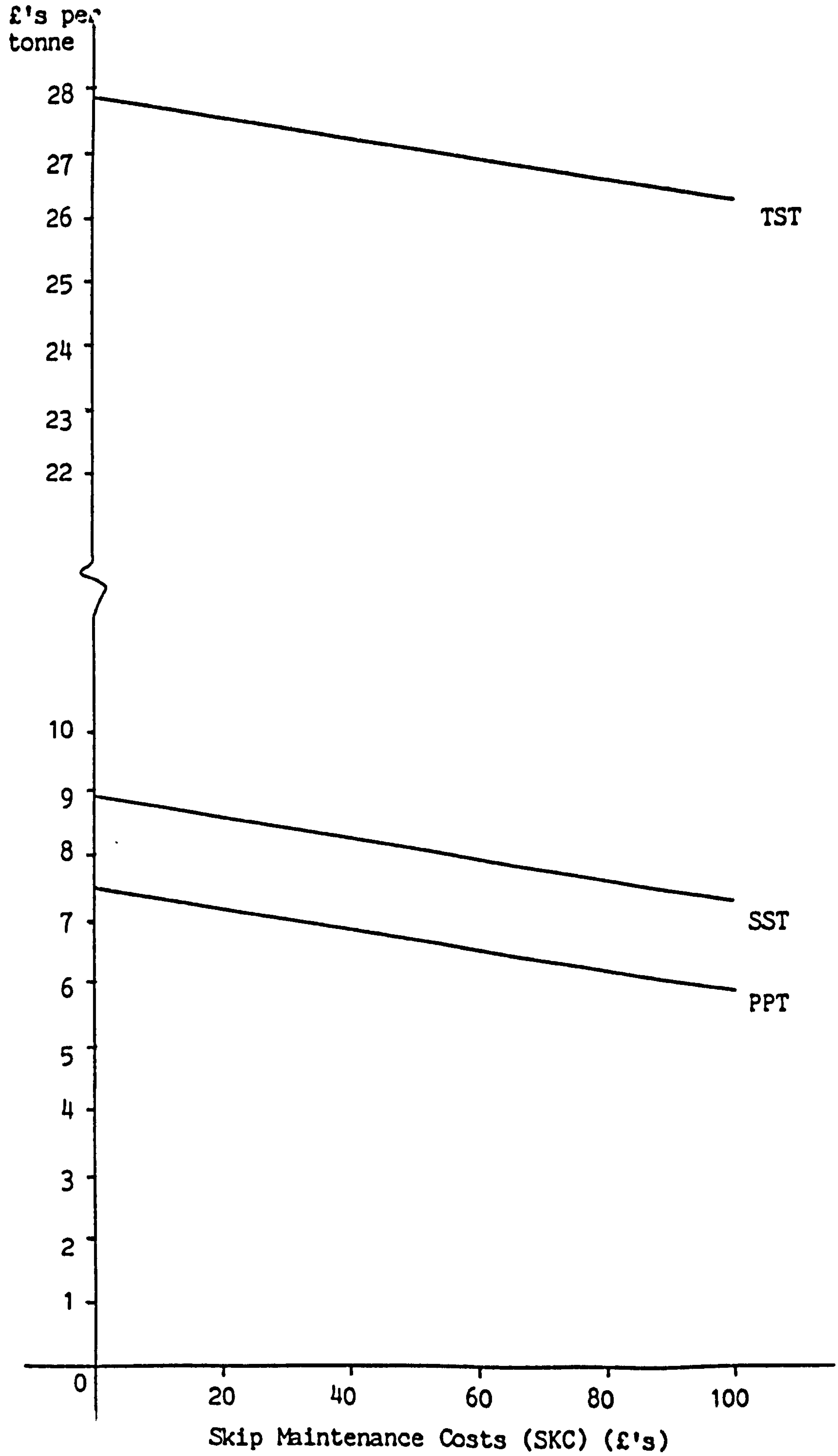


TABLE F6 .13d Effects Of Changes On Skip Maintenance Costs (SKC) On Viability Measures (PPT, SST, TST)
(W=10, M=20, GRT=507.9)



F.6.15 Effects Of Changes In Skip Maintenance Costs (SKM) On Profit/Loss Breakeven Boundary (PPT)

SKIP MNTENANCE SKM	WASTE GENERATION W (Kilogrammes Per Household Per Week) 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
0	81/82	40/41	27/28	20/21	16/17	13/14	11/12	10/11	9/10	8/9	7/8
20	86/87	43/44	28/29	21/22	17/18	14/15	12/13	10/11	9/10	8/9	7/8
40	91/92	45/46	30/31	22/23	18/19	15/16	13/14	11/12	10/11	9/10	8/9
60	96/97	48/49	32/33	24/25	19/20	16/17	13/14	12/13	10/11	9/10	8/9
80	-	50/51	33/34	25/26	20/21	16/17	14/15	12/13	11/12	10/11	9/10
100	-	53/54	35/36	26/27	21/22	17/18	15/16	13/14	11/12	10/11	9/10
120	-	55/56	37/38	27/28	22/23	18/19	15/16	13/14	12/13	11/12	10/11

FIGURE F6.14a Effect Of Changes In Skip Maintenance Costs (SKC) On Profit/Loss Breakeven Boundary (PPT)

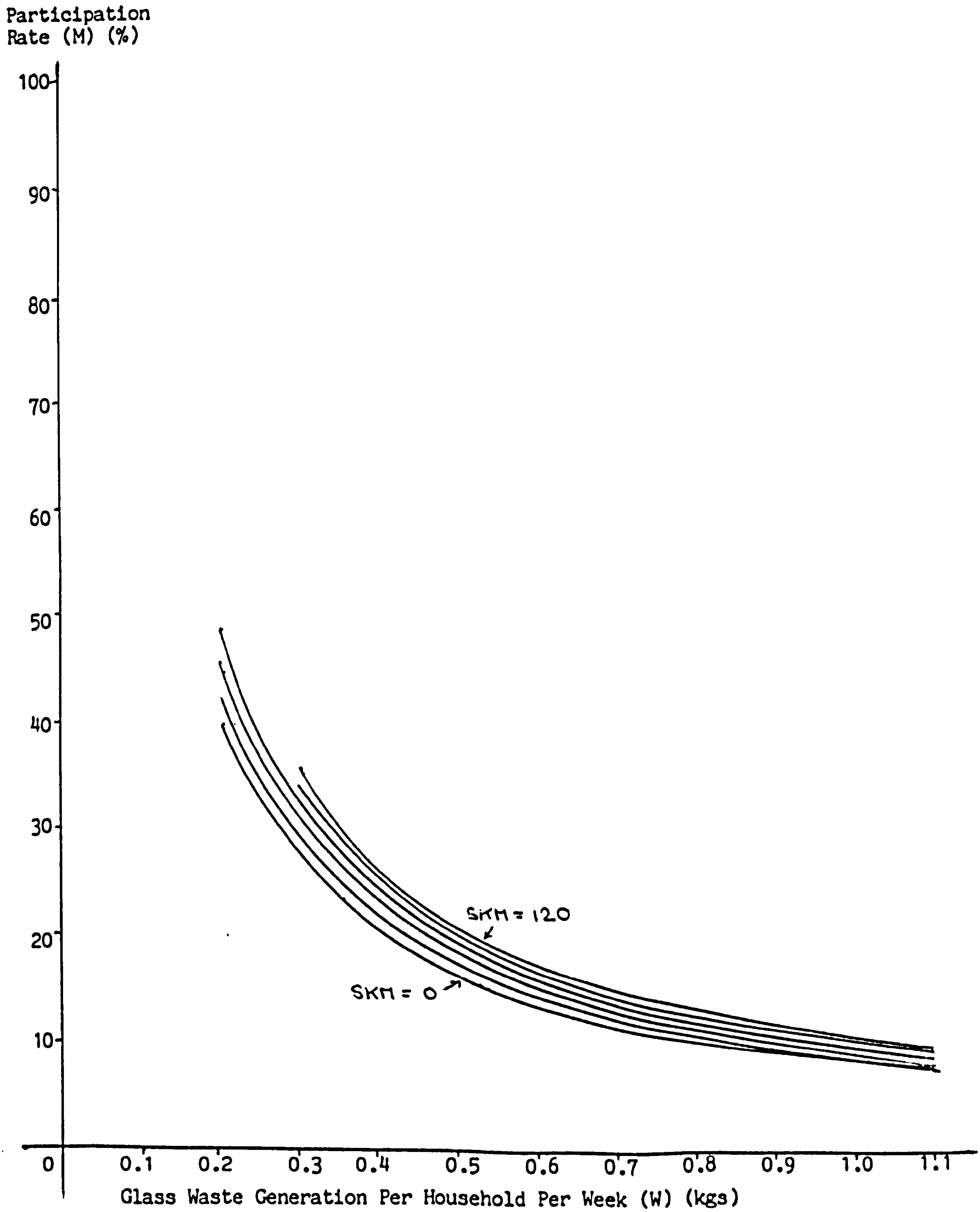


TABLE F.6.16 Effects Of Changes On On-Going Publicity Costs (PUB) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	On-Going Publicity Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	PUB	PPT	SST	TST
10	10	254	0	1.69	3.11	22.11
			100	1.30	2.72	21.72
			200	0.91	2.33	21.33
			300	0.51	1.93	20.93
			400	0.12	1.54	20.54
			488	-0.23	1.19	20.19
			500	-0.28	1.14	20.14
			600	-0.67	0.75	19.75
W	M	GRT	PUB	PPT	SST	TST
4	10	101.6	0	-14.81	-13.39	5.61
			100	-15.79	-14.37	4.63
			200	-16.78	-15.36	3.64
			300	-17.76	-16.34	2.66
			400	-18.74	-17.32	1.68
			488	-19.61	-18.19	0.81
			500	-19.73	-18.31	0.69
			600	-20.71	-19.29	-0.29
W	M	GRT	PUB	PPT	SST	TST
4	20	203.2	0	-1.06	0.36	19.36
			100	-1.55	-0.13	18.87
			200	-2.04	-0.62	18.38
			300	-2.53	-1.11	17.89
			400	-3.03	-1.61	17.39
			488	-3.46	-2.04	16.96
			500	-3.52	-2.10	16.90
			600	-4.01	-2.59	16.41
W	M	GRT	PUB	PPT	SST	TST
10	20	507.9	0	7.19	8.61	27.61
			100	7.00	8.42	27.42
			200	6.80	8.22	27.22
			300	6.60	8.02	27.02
			400	6.41	7.83	26.83
			488	6.23	7.65	26.65
			500	6.21	7.63	26.63
			600	6.01	7.43	26.43

FIGURE F6 .16a Effect Of Changes In On-Going Publicity Costs (PUB) On Viability Measures (PPT, SST, TST)

(W=10, M=10, GRT=254)

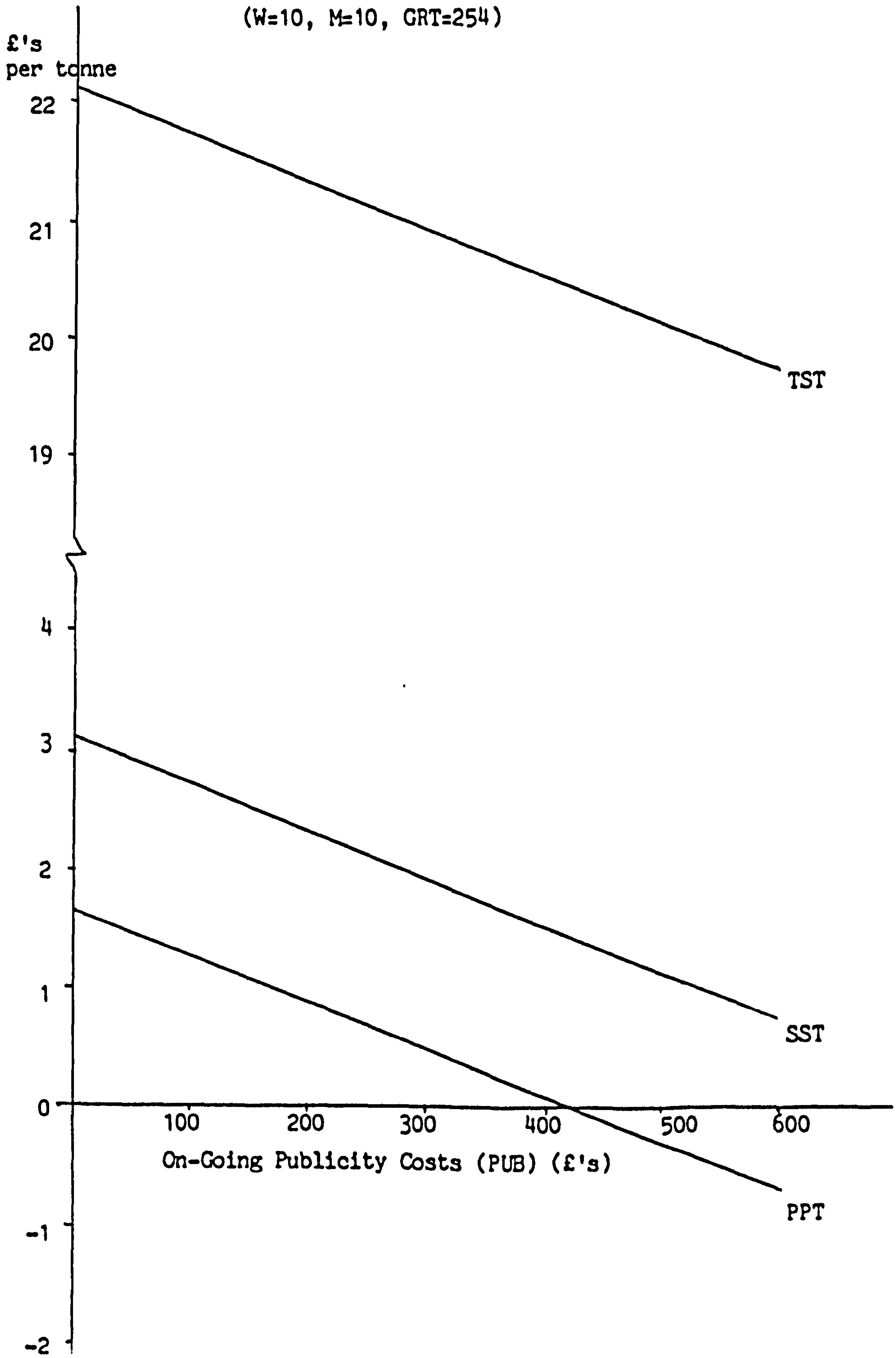


FIGURE F6.16b Effects Of Changes In On-Going Publicity Costs (PUB) On Viability Measures (PPT, SST, TST)
(W=4, M=10, GRT=101.6)

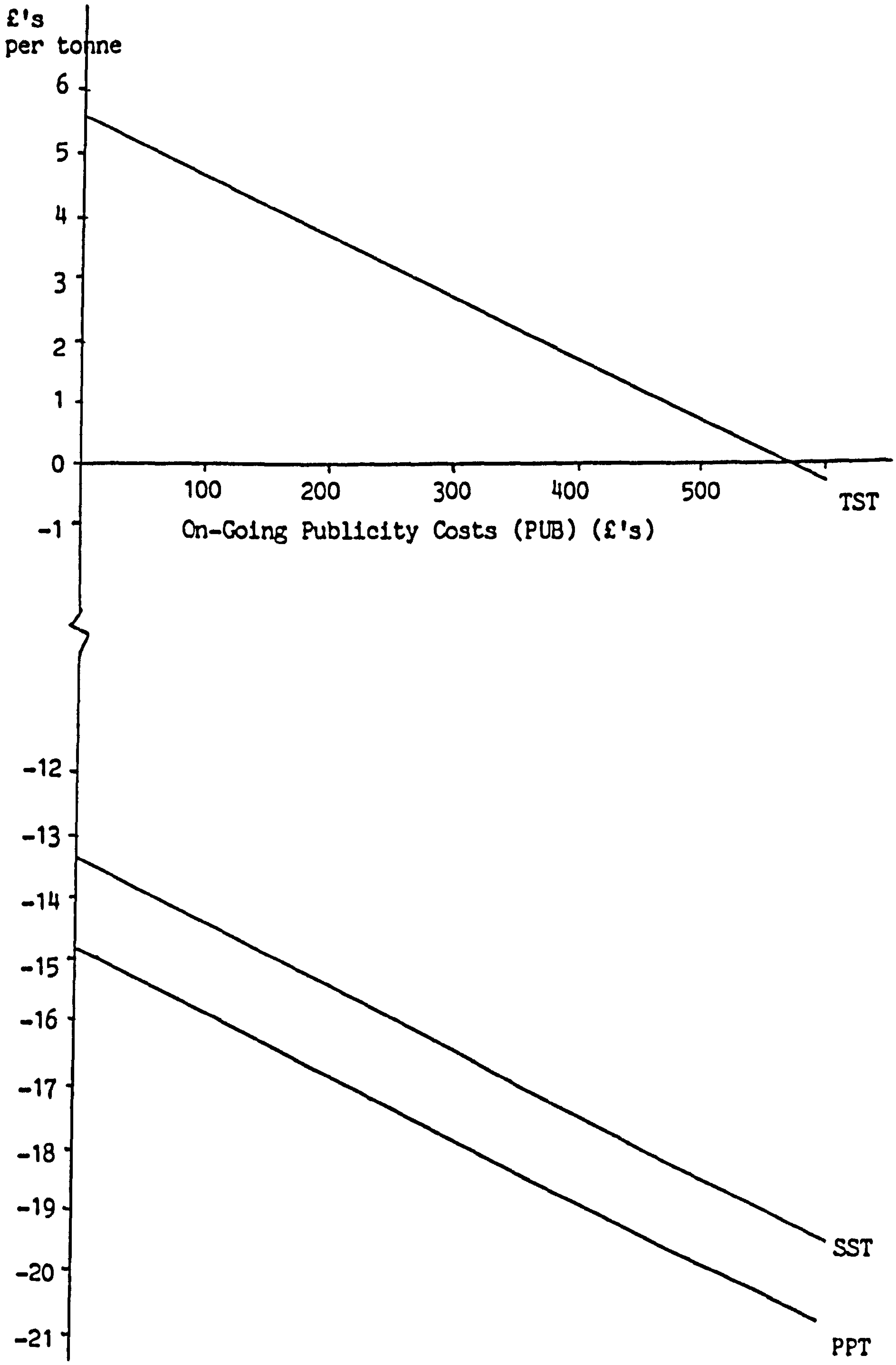


FIGURE F6 .16c Effects Of Changes In On-Going Publicity Costs (PUB) On Viability Measurbs (PPT, SST, TST)

(W=4, M=20, GRT=203.2)

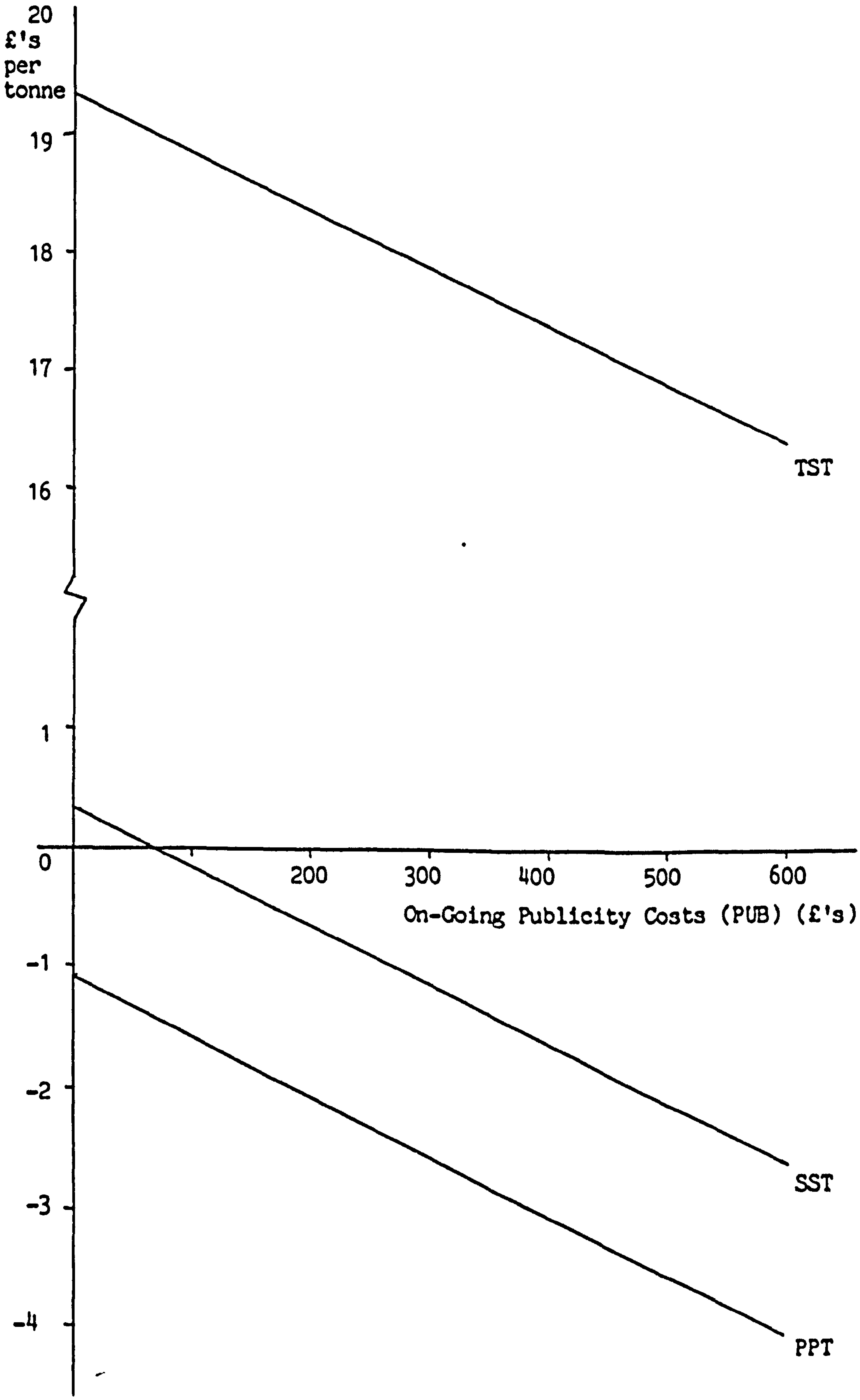
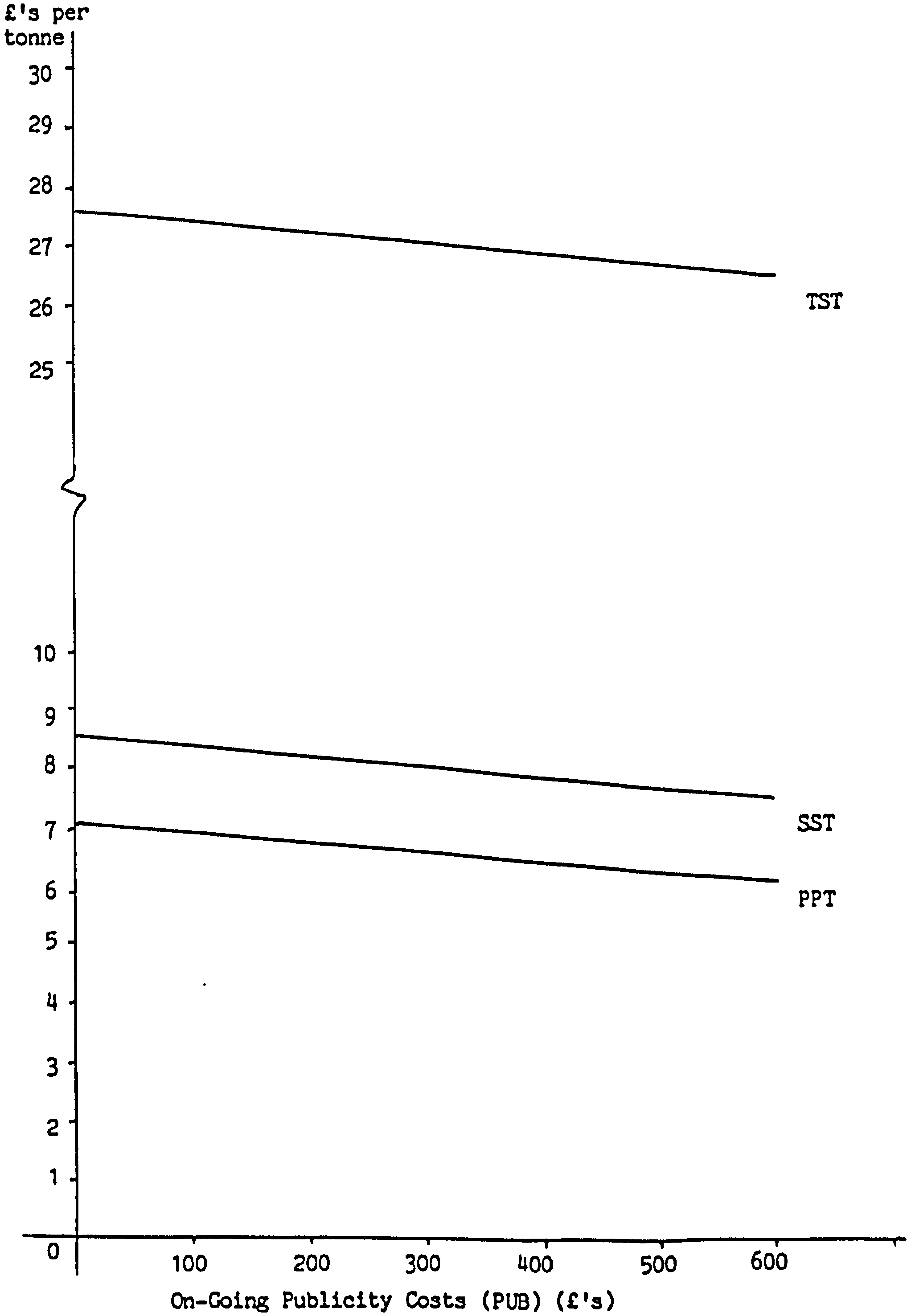


FIGURE F6.16d Effect Of Changes In On-Going Publicity Costs (PUB) On ViabilityyMeasures (PPT, SST, TST)
(W= 10, M=20, GRT=507.9)



F.6.17 Effects Of Changes In On-Going Publicity Costs (PUB) On Profit/Loss Breakeven Boundary (PPT)

ON-GOING PUBLICITY	WASTE GENERATION W (Kilogrammes Per Household Per Week)										
PUB	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
0	86/87	43/44	28/29	21/22	17/18	14/15	12/13	10/11	9/10	8/9	7/8
100	89/90	44/45	29/30	22/23	17/18	14/15	12/13	11/12	9/10	8/9	8/9
200	92/93	46/47	30/31	23/24	18/19	15/16	13/14	11/12	10/11	9/10	8/9
300	95/96	47/48	31/32	23/24	19/20	15/16	13/14	11/12	10/11	9/10	8/9
400	99/100	49/50	33/34	24/25	19/20	16/17	14/15	12/13	11/12	9/10	9/10
488	-	50/51	33/34	25/26	20/21	16/17	14/15	12/13	11/12	10/11	9/10
500	-	51/52	34/35	25/26	20/21	17/18	14/15	12/13	11/12	10/11	9/10
600	-	52/53	35/36	26/27	21/22	17/18	15/16	13/14	11/12	10/11	9/10

FIGURE F6.17 Effect Of Changes In Publicity Costs (PUB) On Profit/Loss Breakeven Boundary (PPT)

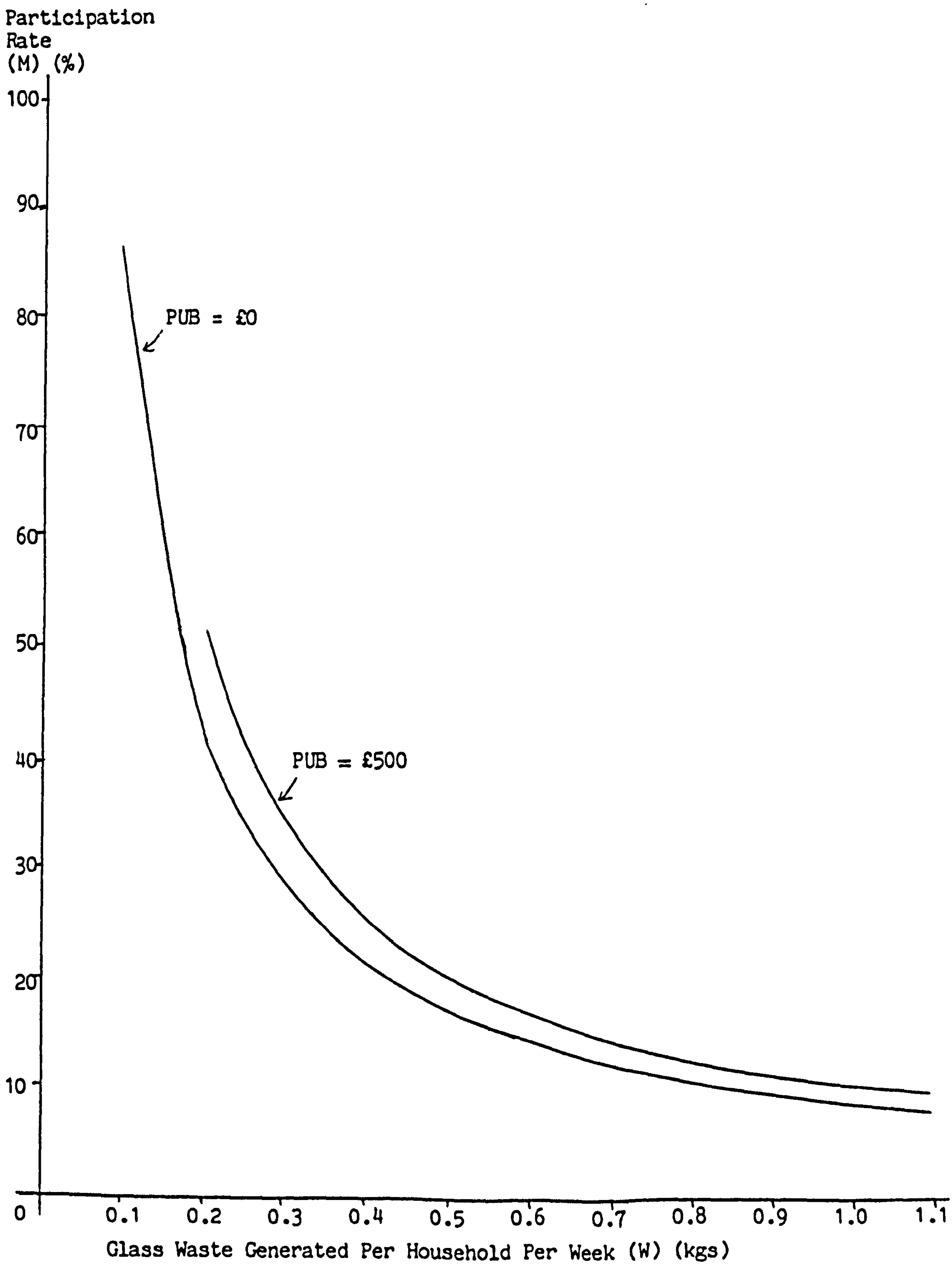


TABLE F.6.18 Effects Of Changes In Disposal Costs (Y= 0 to 10) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Disposal Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	Y	PPT	SST	TST
10	10	254	0.5	1.18	1.68	20.68
			1.0	1.18	2.18	21.18
			1.5	1.18	2.68	21.68
			2.0	1.18	3.18	22.18
			2.5	1.18	3.68	22.68
			3.0	1.18	4.18	23.18
			3.5	1.18	4.68	23.68
			4.0	1.18	5.18	24.18
			4.5	1.18	5.68	24.68
			5.0	1.18	6.18	25.18
			5.5	1.18	6.68	25.68
			6.0	1.18	7.18	26.18
			6.5	1.18	7.68	26.68
			7.0	1.18	8.18	27.18
			7.5	1.18	8.68	27.68
			8.0	1.18	9.18	28.18
			8.5	1.18	9.68	28.68
			9.0	1.18	10.18	29.18
			9.5	1.18	10.68	29.68
			10.0	1.18	11.18	30.18
W	M	GRT	Y	PPT	SST	TST
4	10	101.6	0.5	-14.90	-14.40	4.60
			1.0	-14.90	-13.90	5.10
			1.5	-14.90	-13.40	5.60
			2.0	-14.90	-12.90	6.10
			2.5	-14.90	-12.40	6.60
			3.0	-14.90	-11.90	7.10
			3.5	-14.90	-11.40	7.60
			4.0	-14.90	-10.90	8.10
			4.5	-14.90	-10.40	8.60
			5.0	-14.90	- 9.90	9.10
			5.5	-14.90	- 9.40	9.60
			6.0	-14.90	- 8.90	10.10
			6.5	-14.90	- 8.40	10.60
			7.0	-14.90	- 7.90	11.10
			7.5	-14.90	- 7.40	11.60
			8.0	-14.90	- 6.90	12.10
			8.5	-14.90	- 6.40	12.60
			9.0	-14.90	- 5.90	13.10
			9.5	-14.90	- 5.40	13.60
			10.0	-14.90	- 4.90	14.10

TABLE F.6.18 (Continued) Effects Of Changes In Disposal Costs (Y= 0 to 10) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Disposal Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	Y	PPT	SST	TST
4	20	203.2	0.5	-1.50	-1.00	18.00
			1.0	-1.50	-0.50	18.50
			1.5	-1.50	0.00	19.00
			2.0	-1.50	0.50	19.50
			2.5	-1.50	1.00	20.00
			3.0	-1.50	1.50	20.50
			3.5	-1.50	2.00	21.00
			4.0	-1.50	2.50	21.50
			4.5	-1.50	3.00	22.00
			5.0	-1.50	3.50	22.50
			5.5	-1.50	4.00	23.00
			6.0	-1.50	4.50	23.50
			6.5	-1.50	5.00	24.00
			7.0	-1.50	5.50	24.50
			7.5	-1.50	6.00	25.00
			8.0	-1.50	6.50	25.50
			8.5	-1.50	7.00	26.00
			9.0	-1.50	7.50	26.50
			9.5	-1.50	8.00	27.00
			10.0	-1.50	8.50	27.50
W	M	GRT	Y	PPT	SST	TST
10	20	507.9	0.5	6.53	7.03	26.03
			1.0	6.53	7.53	26.53
			1.5	6.53	8.03	27.03
			2.0	6.53	8.53	27.53
			2.5	6.53	9.03	28.03
			3.0	6.53	9.53	28.53
			3.5	6.53	10.03	29.03
			4.0	6.53	10.53	29.53
			4.5	6.53	11.03	30.03
			5.0	6.53	11.53	30.53
			5.5	6.53	12.03	31.03
			6.0	6.53	12.53	31.53
			6.5	6.53	13.03	32.03
			7.0	6.53	13.53	32.53
			7.5	6.53	14.03	33.03
			8.0	6.53	14.53	33.53
			8.5	6.53	15.03	34.03
			9.0	6.53	15.53	34.53
			9.5	6.53	16.03	35.03
			10.0	6.53	16.53	35.53

FIGURE F6.13a. Effects Of Changes In Disposal Costs (Y) On Viability Measures (PPT, SST, TST)

(W= 4, M=10, GRT= 101.6)

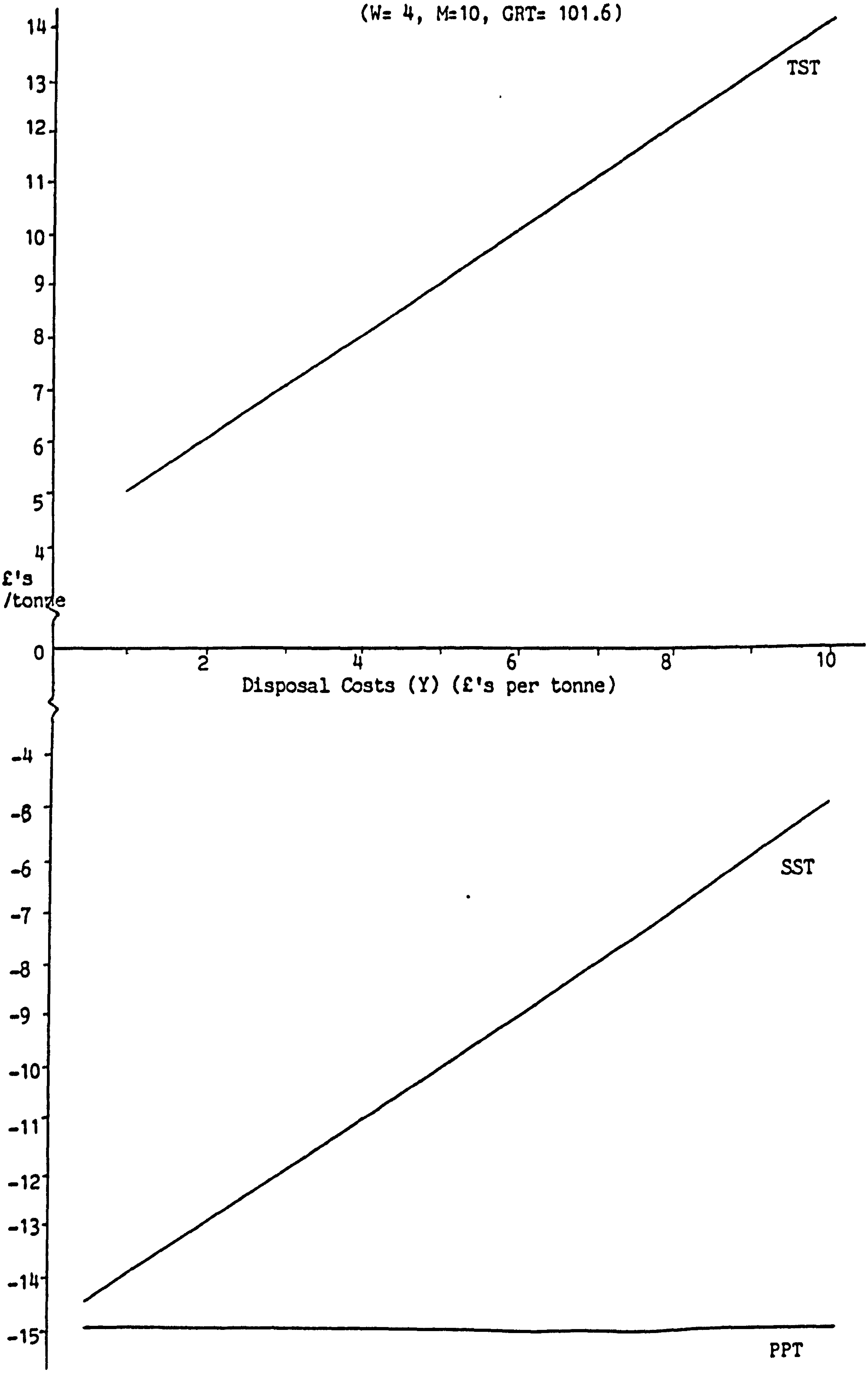


FIGURE F6.18b Effect Of Changes In Disposal Costs (Y) On Viability Measures (PPT, SST, TST)

(W=4, M=20, GRT=208.2)

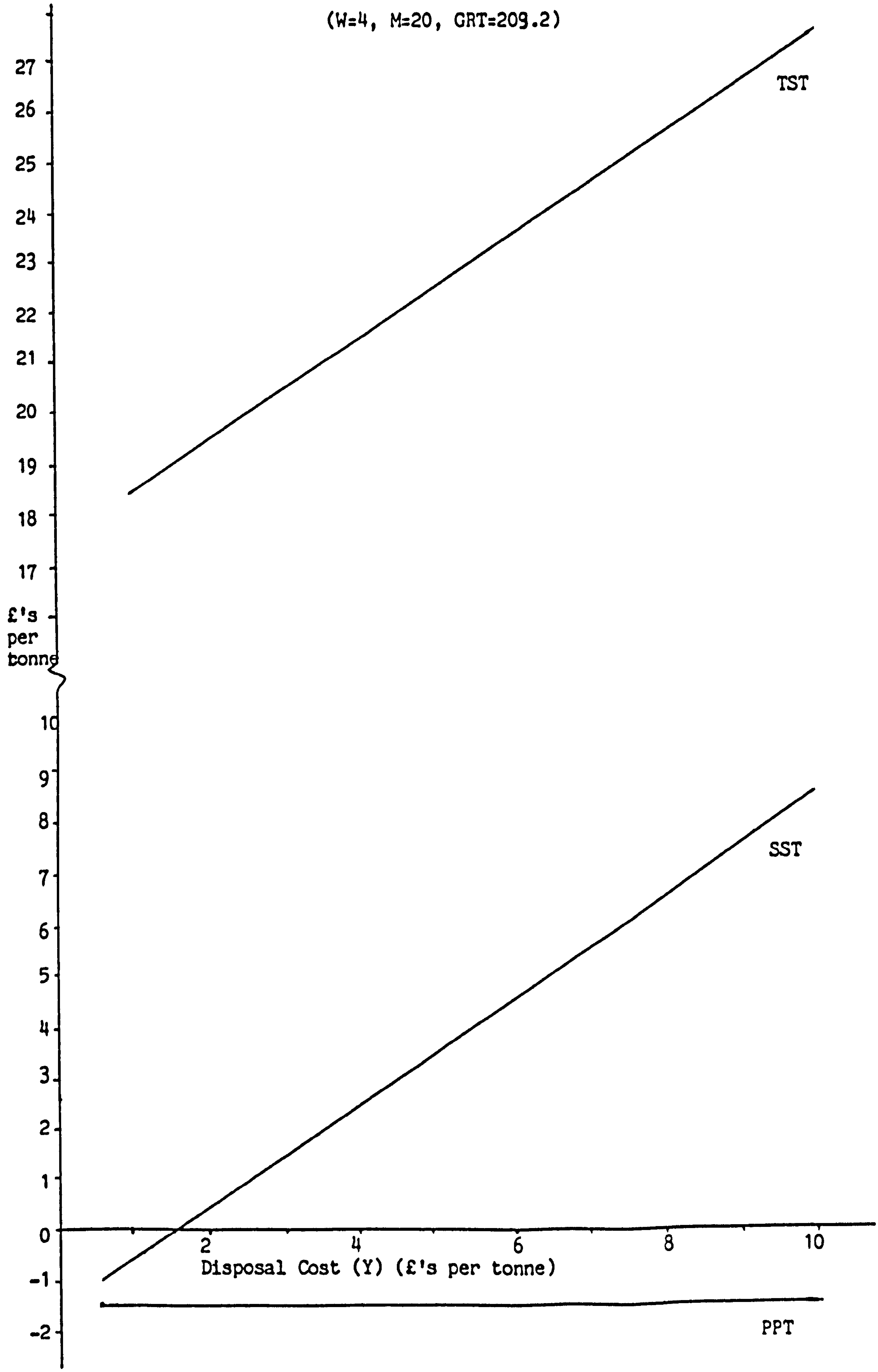


FIGURE F6.18c Effects Of Changes In Disposal Cost (Y) On Viability Measures (PPT, SST, TST)

(W=10, M=10, GRT=254)

FIGURE F6.18d Effect Of Changes In Disposal Costs (Y) On Viability Measures (PPT, SST, TSTO
(W=10, M=20, GRT=507.9)

TABLE F.6.19 Effects Of Changes In Collection Costs (C= 0 to 40) On Viability Measures (PPT, SST, TST)

Glass/Dom Prem/Week	Participtn Rate (%)	Tonnage Recovered (tonnes)	Disposal Costs	Private Profit /Loss	Disposal Systems Surplus	Total Systems Surplus
W	M	GRT	C	PPT	SST	TST
10	10	254	0.0	1.18	2.60	2.60
			5.0	1.18	2.60	7.60
			10.0	1.18	2.60	12.60
			15.0	1.18	2.60	17.60
			20.0	1.18	2.60	22.60
			25.0	1.18	2.60	27.60
			30.0	1.18	2.60	32.60
			35.0	1.18	2.60	37.60
			40.0	1.18	2.60	42.60
W	M	GRT	C	PPT	SST	TST
4	10	101.6	0.0	-14.90	-13.48	-13.48
			5.0	-14.90	-13.48	-8.48
			10.0	-14.90	-13.48	-3.48
			15.0	-14.90	-13.48	1.52
			20.0	-14.90	-13.48	6.52
			25.0	-14.90	-13.48	11.52
			30.0	-14.90	-13.48	16.52
			35.0	-14.90	-13.48	21.52
			40.0	-14.90	-13.48	26.52
W	M	GRT	C	PPT	SST	TST
4	20	203.2	0.0	-1.50	-0.08	-0.08
			5.0	-1.50	-0.08	4.92
			10.0	-1.50	-0.08	9.92
			15.0	-1.50	-0.08	14.92
			20.0	-1.50	-0.08	19.92
			25.0	-1.50	-0.08	24.92
			30.0	-1.50	-0.08	29.92
			35.0	-1.50	-0.08	34.92
			40.0	-1.50	-0.08	39.92
W	M	GRT	Y	PPT	SST	TST
10	20	507.9	0.0	6.53	7.95	7.95
			5.0	6.53	7.95	12.95
			10.0	6.53	7.95	17.95
			15.0	6.53	7.95	22.95
			20.0	6.53	7.95	27.95
			25.0	6.53	7.95	32.95
			30.0	6.53	7.95	37.95
			35.0	6.53	7.95	42.95
			40.0	6.53	7.95	47.95

FIGURE F6.19a Effects Of Changes In Collection Costs (C) On Viability Measures (PPT, SST, TST)

(W=10, M=10, GRT=254)

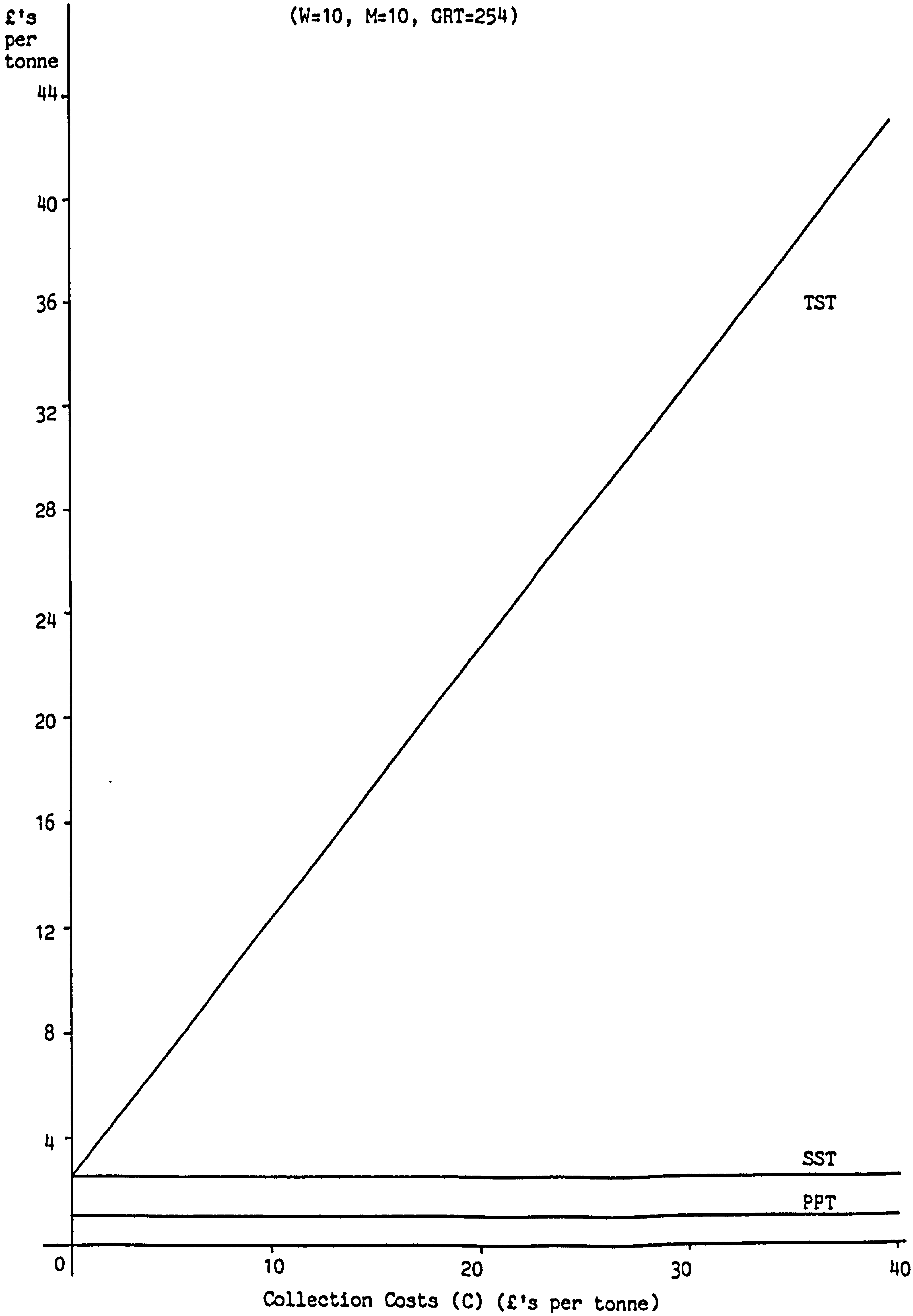


FIGURE F6.19b Effects Of Changes In collection Costs (C) On Viability Measures (PPT, SST, TST)

(W=4, M=10, GRT=101.6)

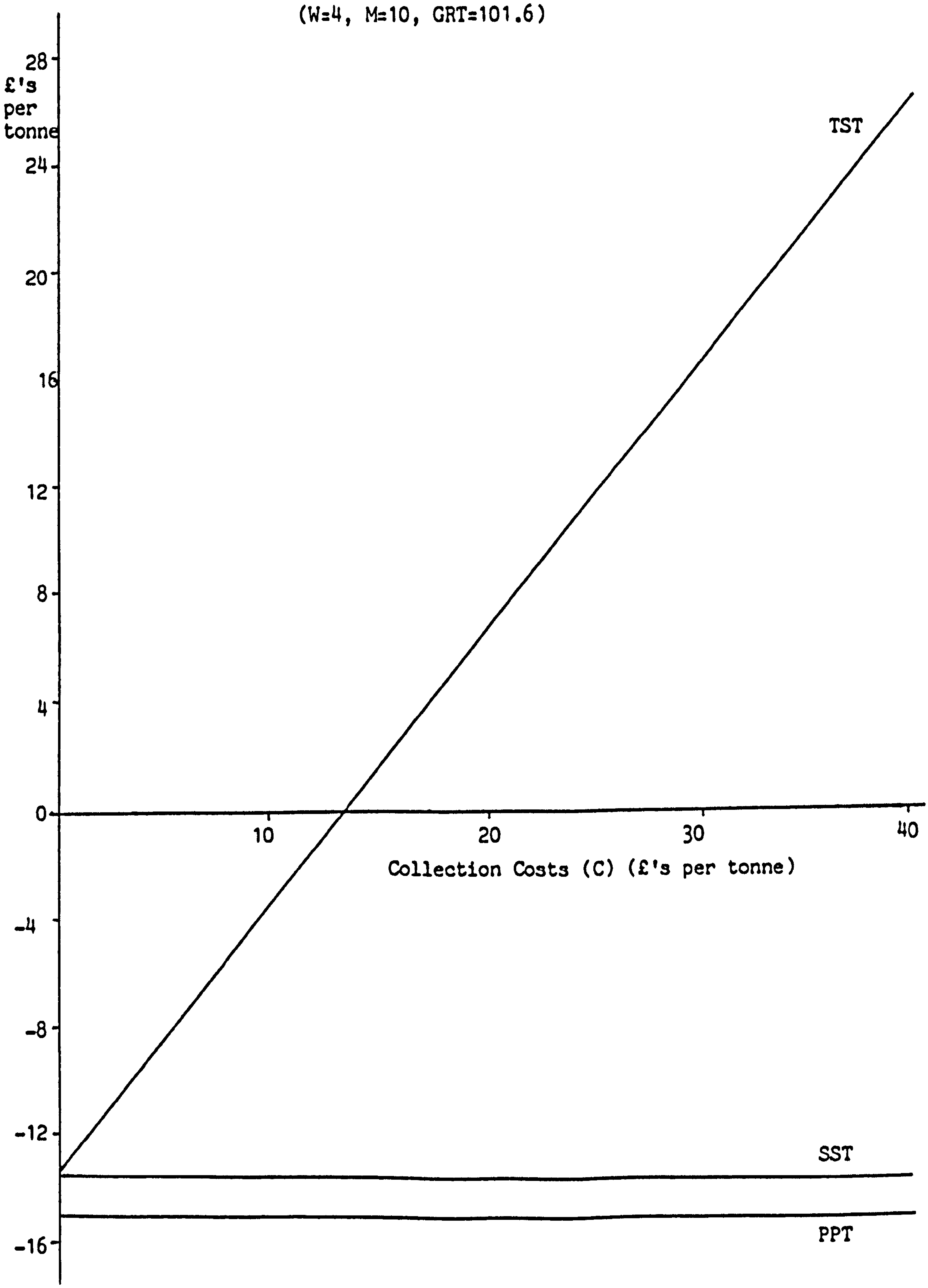


FIGURE F6.19c Effects Of Changes In Collection Costs (C) On Viability Measures (PPT, SST, TST)

(W=4, M=20, GRT=203.2)

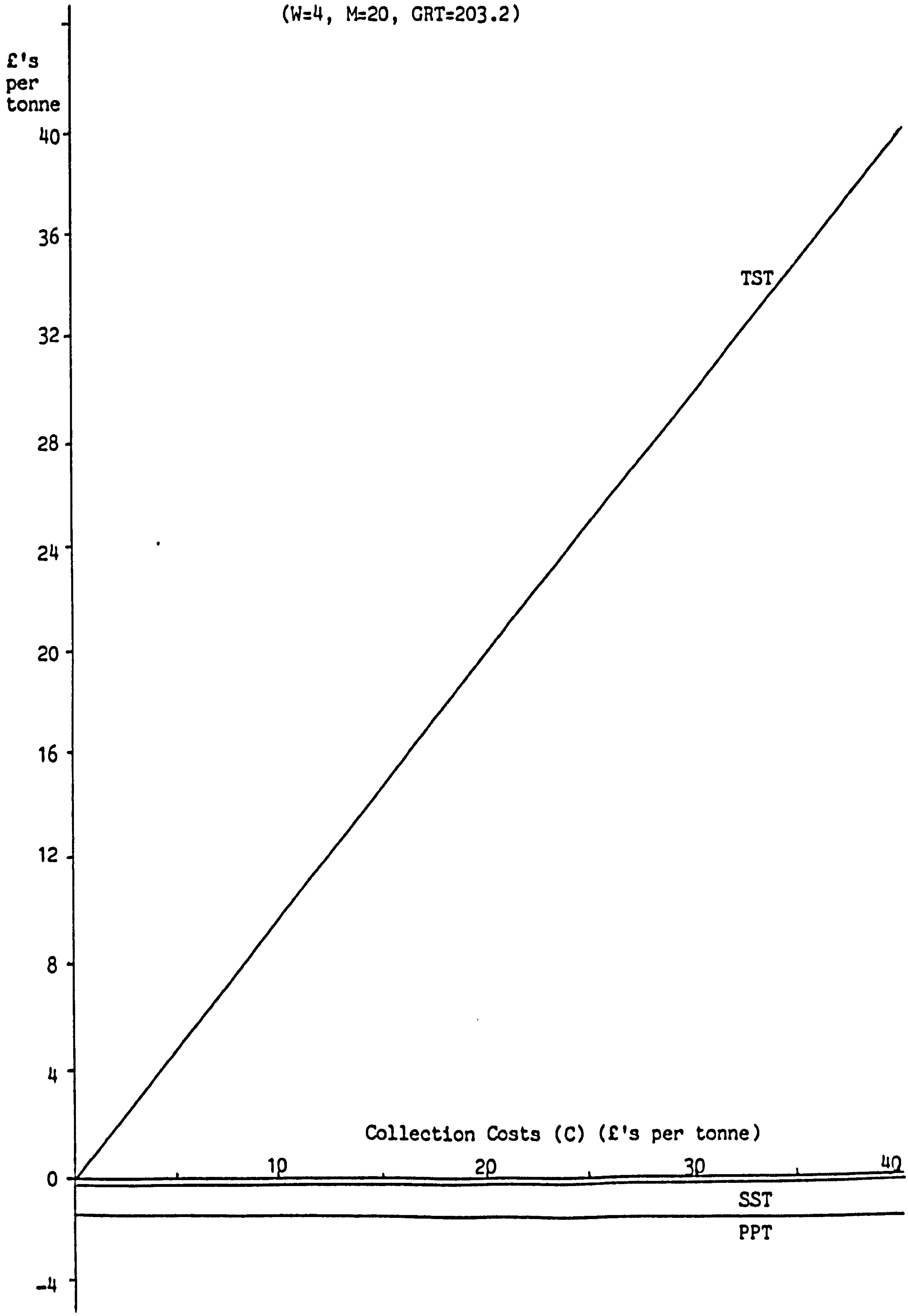
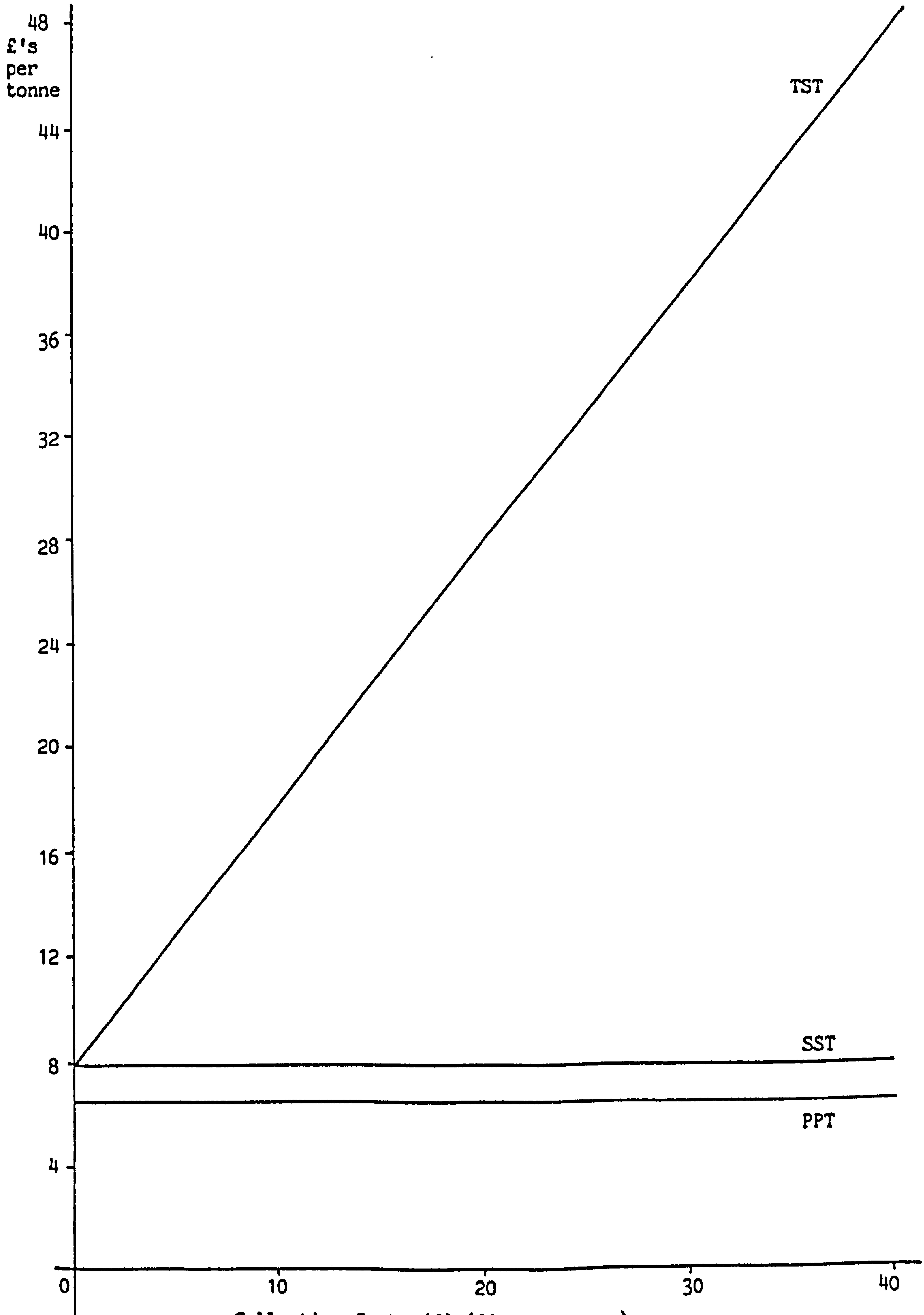


FIGURE F6.19d Effect Of Changes In Collection Costs (C) On Viability Measures (PPT, SST, TST)

(W=10, M=20, GRT=507.9)



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F.7 Variations From The Hypothetical Local Authority (HLA)

F.7.1 Rural Area

A recovery scheme set up in a more rural area is faced with similar problems to the base case. The main difference is in the more widespread and smaller population centres. Thus the quantity of waste glass available for collection will be smaller.

A rural area with 18100 people in 87,553 hectares has been looked at to see whether a glass recycling scheme would be viable. Table F7.1 outlines the conditions for the recovery scheme. The area has three population centres, which will support one bottle bank each. The banks are uplifted by an existing council vehicle, and are delivered to a central storage site. The glass is bulk transported to the processor by a private haulier. It is these two costs of uplift and bulk transport are the key to establishing a successful operation. In a rural area the extra distances involved may increase the costs incurred. In the first instance these costs are kept the same as in the original base case. With the only change being a reduction in the number of banks to three, leading to a reduction in overall bank costs.

Income will be based on similar lines to the base case, but with less glass the returns will be lower. Collection costs in a rural area might be less susceptible to changes, due to the extra distances involved. Any benefits may result from reducing the number of collections made and thus the number of vehicles that a council will need to operate a collection system.

A summary of costs is shown in Table F7.2. Four scenarios have been isolated which span the profit/loss boundary. Again the main costs are set up costs which dominate the whole recovery operation. These can be reduced with the costs being spread over greater tonnages. The main components are the skip costs.

At the outset, the viability of a rural recovery scheme is marginal; with a scheme needing a high participation rate to cover its costs. They need to recover about 102 tonnes per annum to breakeven from a maximum available of 345 tonnes of glass per annum. The scheme can breakeven at various participation and generation rates which are shown as line zero in Figure F7.A. At a household contribution rate of 1.0 kilogrammes, 41% of all households will need to participate. Alternatively, at a generation rate of 0.5 kilogrammes 66% of all households would take part. It would be important to maintain the public's interest and thus participation levels through publicity. But if publicity costs and skip maintenance costs are treated as zero it would improve the area in which a scheme would be viable. In Figure F7.A the profit/loss boundary is pushed to the left increasing the profit area (Line 1).

If the area is far from the processor, bulk transport costs could be at the high end of the scale, unless Council can transship to a neighbouring Council. If the bulk lorry cost is increased from £4.00 per tonne to £8.00 per tonne this will push the profit/loss boundary outwards reducing the profitable area (Line 4 in Figure F7.A).

Table F7.2 shows that set up costs are the main cost component. If these can be reduced it will improve the viability of a rural recovery scheme. The Council could use existing storage facilities or a demountable body to minimise storage costs. Site costs can be minimised by resiting bins and using existing tarmaced sites. Bottle bank costs can be reduced by modification of existing skips or through sponsorship. The effects of changes in these costs have been illustrated for the base case in Section 10.5.8.1. If in this case set up costs were treated as zero this has a dramatic effect on the profit/loss boundary. Figure F7.A shows the improvements with zero set up costs represented by line 4. A scheme would then only need to recover 8 tonnes of glass per year for the recovery scheme.

This shows the need to look at all the cost factors at the outset, so that ways can be sought to minimise them. In particular looking at sponsorship, existing storage facilities, and ways of minimising operating costs.

TABLE F7.1 A Summary Of The Bottle Bank Recovery Of Characteristics For A Rural Area

Population:	18,100	Households:	6,033
Area:	87,553 Hectares	Trade Premises:	1,000
Population Density:	0.21 people per hectare		
Site Costs:		Skip Costs:	
Administration:	0	No of Banks:	3
Tarmac Base:	0	Bank Costs:	£746
Railings:	0		
Cost of Litter Bins:	£35	Life of Banks:	5 years
No of Litter Bins:	3		
Car Park Revenue:	0	Storage Costs:	
		Cost of Bays:	1040
Interest Rate:	10%	Life of Bays:	10 years
Operation Costs:			
Collection Costs	£9.47 per uplift		
Site Maintenance	£0.15 per uplift		
Skip Maintenance	£80.00 per skip		
Administration	£100.00 per year		
Publicity	£60.33 per year		
Bulk Transport	£4.50 per tonne		
Income:			
Revenue:			
Clear Glass	£22.00 per tonne	Proportion Of Clear	0.6
Mixed Glass	£18.00 per tonne	Proportion Of Mixed	0.4
Disposal Savings:	£1.42 per tonne		
Collection Savings:	£19.00 per tonne		

FIGURE F7.a The Private Viability Profit/Loss Boundary (PPT) For A Rural Scenario Under Varying Conditions

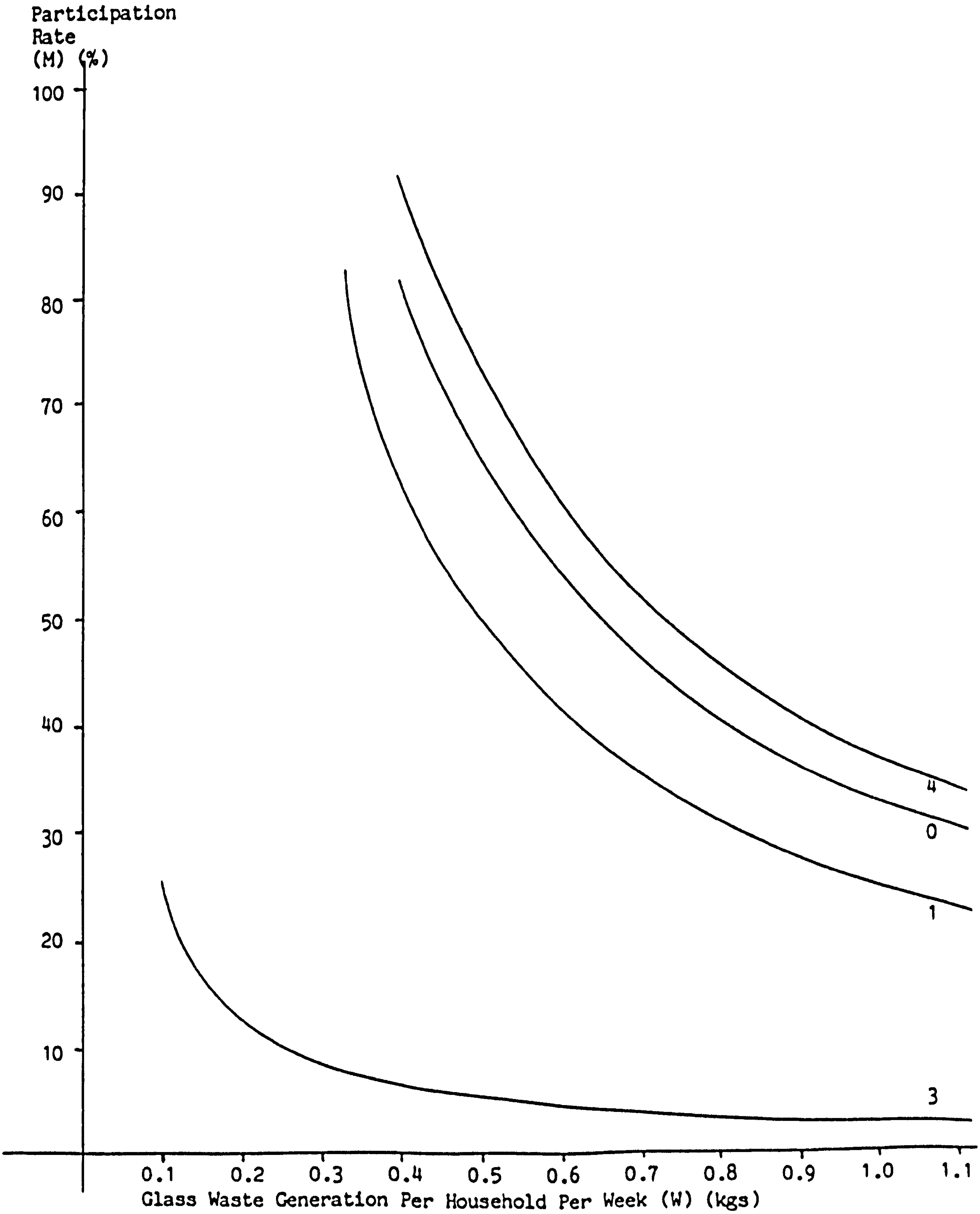


TABLE F7.2 Summary Of Bottle Bank Costs For The Rural Area

Participation Rate:	10	10	40	40
Waste Generation:	10	4	10	4
Tonnage Recovered:	31.4	12.5	125.5	50.2
Set Up Costs	£	£	£	£
Site Costs	21	21	21	21
Skip Costs	671.4	671.4	671.4	671.4
Storage Costs	208	208	208	208
Publicity Costs	0	0	0	0
Crusher Costs	0	0	0	0
TOTAL	900.4	900.4	900.4	900.4
SUCPT = SUC/GRT	28.67	72.03	7.17	17.94

Operating Costs	£	%	£	%	£	%	£	%
Collection Costs	3.16	15.4	3.16	7.9	3.16	28.7	3.16	20.0
Site Maintenance	0.15	0.7	0.15	0.4	0.15	1.4	0.15	1.0
Skip Maintenance	7.64	37.2	19.20	48.2	1.91	17.4	4.78	30.3
Administration	3.18	15.5	8.00	20.1	0.79	7.2	1.99	12.6
Publicity	1.92	9.3	4.82	12.1	0.48	4.4	1.20	7.6
Bulk Transport	4.50	21.9	4.50	11.3	4.50	40.9	4.50	28.5
Storage Maintenance	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Crusher Usage	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
TOTAL	20.55	100.0	39.83	100.0	10.99	100.0	15.78	100.0

Gross Operating Costs				
GOPC = OPC * GRT	645.27	497.87	1379.24	792.16
INCOME				
Revenue:				
TRS1	414.48	165.00	1656.60	662.64
TRS4	226.08	90.00	903.60	361.44
TOTAL	640.56	255.00	2560.20	1024.08
Disposal Cost Savings				
SRD = Y * GRT	44.6	17.75	178.20	71.28
Collection Cost Savings				
SRC = R * GRT	596.60	237.25	2384.50	953.80

NET EFFECTS

A. Private Viability				
PPT(M,W) =	-£28.83	- £91.46	+ £2.24	- £13.32
B. Disposal Systems Surplus				
SST(M,W) =	-£27.39	- £90.01	+ £3.66	- £11.89
C. Total Systems Surplus				
TST(M,W) =	- £8.39	- £71.01	+ £22.66	+ £7.11

TABLE F7.3 A Variation On Rural Case Study

Changes in Publicity Costs And Skip Maintenance Costs

Participation Rate:	10		10		40		40	
Waste Generation:	10		4		10		4	
Tonnage Recovered:	31.4		12.5		125.5		50.2	
Set Up Costs								
Site Costs	21		21		21		21	
Skip Costs	671.4		671.4		671.4		671.4	
Storage Costs	208		208		208		208	
Publicity Costs	0		0		0		0	
Crusher Costs	0		0		0		0	
TOTAL	900.4		900.4		900.4		900.4	
SUCPT = SUC/GRT	28.67		72.03		7.17		17.94	
Operating Costs	£	%	£	%	£	%	£	%
Collection Costs	3.16	28.8	3.16	19.9	3.16	36.7	3.16	32.2
Site Maintenance	0.15	1.4	0.15	0.9	0.15	1.7	0.15	1.5
Skip Maintenance	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Administration	3.18	28.9	8.00	50.6	0.79	9.2	1.99	20.0
Publicity	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Bulk Transport	4.50	40.9	4.50	28.5	4.50	52.3	4.50	45.9
Storage Maintenance	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Crusher Usage	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
TOTAL	10.99	100.0	15.81	100.0	8.60	100.0	9.80	100.0
Gross Operating Costs								
GOPC = OPC * GRT	645.27		497.87		1379.24		792.16	
INCOME								
Revenue:								
TRS1	414.48		165.00		1656.60		662.64	
TRS4	226.08		90.00		903.60		361.44	
TOTAL	640.56		255.00		2560.20		1024.08	
Disposal Cost Savings								
SRD = Y * GRT	44.6		17.75		178.20		71.28	
Collection Cost Savings								
SRC = R * GRT	596.60		237.25		2384.50		953.80	
NET EFFECTS								
PPT (M,W)	-£19.26		-£67.44		+£4.6		-£7.34	
SST (M,W)	-£17.84		-£66.02		+£6.02		-£5.92	
TST (M,W)	+ £1.16		-£47.02		+£25.02		+£13.08	

Appendix F

F7.1 Rural Area

In a more rural area the factors considered are the same, although they will need to be adjusted to fit local conditions.

TABLE F7.1 Rural System

a. Scenario 0

VIABILITY MEASURES	WASTE GENERATION W (Kilogrammes)										
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
PPT	-	-	-	81/82	65/66	54/55	46/47	40/41	36/37	32/33	29/30
SST	-	-	97/98	73/74	58/59	48/49	41/42	36/37	32/33	29/30	26/27
TST	-	62/63	41/42	31/32	25/26	20/21	17/18	15/16	13/14	12/13	11/12

b. Scenario 1
PUBPT = 0
SKMPT = 0

VIABILITY MEASURES	WASTE GENERATION W (Kilogrammes)										
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
PPT	-	-	83/84	62/63	50/51	41/42	35/36	31/32	27/28	25/26	22/23
SST	-	-	75/76	56/57	45/46	37/38	32/33	28/29	25/26	22/23	20/21
TST	96/97	48/49	32/33	24/25	19/20	16/17	13/14	12/13	10/11	9/10	8/9

c. Scenario
SUC = 0
PUBPT = 0
SKMPT = 0

VIABILITY MEASURES	WASTE GENERATION W (Kilogrammes)										
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
PPT	25/26	12/13	8/9	6/7	5/6	4/5	3/4	3/4	2/3	2/3	2/3
SST	22/23	11/12	7/8	5/6	4/5	3/4	3/4	2/3	2/3	2/3	2/3
TST	9/10	4/5	3/4	2/3	1/2	1/2	1/2	1/2	1/2	0/1	0/1

d. Scenario
PUBPT = 0
SKMPT = 0
BTR = 8.5

VIABILITY MEASURES	WASTE GENERATION W (Kilogrammes)										
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
PPT	-	-	-	91/92	73/74	61/62	52/53	45/46	40/41	36/37	33/34
SST	-	-	-	78/79	62/63	52/53	44/45	39/40	34/35	31/32	28/29
TST	-	54/55	36/37	27/28	21/22	18/19	15/16	13/14	12/13	10/11	9/10

F.7.2 Urban Area

In a more urban area from the base case the factors to be considered when assessing the viability of a recovery scheme are very similar. Population levels will be higher, and population densities will be higher. With more waste material available an urban area would be able to support more bottle banks. However, with the importance of the capital costs in any assessment, there establishment would need to be considered carefully. It is more likely an urban area would build up a recovery scheme in a series of stages. Initially, the operator would indentify the prime sites for bottle banks and establish those first. Once a scheme has been established the Council could look at the opportunities of expansion (Section 10.4.9.4).

A larger populated area would be able to support more banks. An examination of a system with 20 banks is looked at, this provides 1 bank per 6000 people. The variables for the bottle bank system are shown in Table F7.4. It is felt that other conditions would remain the same, with small adjustments in skip maintenance due to the extra numbers, and increased needs for publicity with more households.

A summary of costs for four scenarios is shown in Table F7.5. These scenarios span the profit/loss boundaries. Set up costs are significant with the large number of banks if all are set up at once. Although it is likely that banks will be set up over a period as the recovery scheme proves that it is successfull. With more glass waste available to be recovered it is the operating costs that contribute the most to the assessment of the viability of a recovery system. It shows that collection costs and bulk transport costs are the most important elements, which will need careful control by the operator of the system. Also of importance are publicity costs and skip maintenance costs. With the importance of maintaining participation levels publicity is of importance in establishing a successful scheme. All these costs are more significant when lower tonnages are recovered.

Income comes from three sources. Revenue is based on tonnage of glass recovered, and in an urban area this has a higher potential. More influential will be potential savings in disposal and collection costs. In urban areas disposal is likely to be a problem with waste being taken a long way from the city to be landfilled or incinerated. This is likely to lead to higher disposal costs. So any reduction in the waste being disposed of can benefit a Council's waste management activities. Also collection cost savings are relevant, as in a more urban area collection routes may be able to be re-organised if there is less waste to be collected. These savings could be very significant boosting the potential viability of a recovery scheme.

Figure 10.0 shows the profit/loss boundaries for a more urban scheme. It shows that a recovery scheme can make a positive return provided the contribution and participation levels are right. At a contribution of 0.7 kilogrammes per household per week, 14% of households need to participate for the scheme to breakeven. On a private viability level the scheme would need to recover 600 tonnes of glass to breakeven, which is about 10% of the glass waste that is available. A lower participation rate is needed, as ther are more household in the area. If disposal savings are included the scheme would need to recover 520 tonnes to breakeven, and with collection costs only 230 tonnes.

In the first instance if a small scheme is started with 8 banks, the set up costs are less significant. A scheme would be able to recover its costs if the scheme recovers 300 tonnes on a private viability basis; and only 125 tonnes if disposal and collection savings are included. It shows that a scheme in an urban area can succeed in recovering its costs.

TABLE F7.4 A Summary Of The Bottle Bank Recovery Of Characteristics For An Urban Area

Population: 300,000 | Households: 110,000
Area: 25,039 Hectares | Trade Premises: 10,455
Population Density: 11.98 people per hectare

Site Costs:		**Skip Costs:**	
Administration:	0	No of Banks:	20
Tarmac Base:	0	Bank Costs:	£746
Railings:	0		
Cost of Litter Bins:	£35	Life of Banks:	5 years
No of Litter Bins:	20		
Car Park Revenue:	0	**Storage Costs:**	
		Cost of Bays:	1040
Interest Rate:	10%	Life of Bays:	10 years

Operation Costs:

Collection Costs	£9.47 per uplift
Site Maintenance	£0.15 per uplift
Skip Maintenance	£80.00 per skip
Administration	£100.00 per year
Publicity	£1100.00 per year
Bulk Transport	£4.50 per tonne

Income:

Revenue:

Clear Glass	£22.00 per tonne	Proportion Of Clear 0.6
Mixed Glass	£18.00 per tonne	Proportion Of Mixed 0.4

Disposal Savings: £1.42 per tonne

Collection Savings: £19.00 per tonne

TABLE F7.4 Summary Of Bottle Bank Costs For An Urban Area

Participation Rate:	10	10	40	40
Waste Generation:	10	4	10	4
Tonnage Recovered:	572	228.8	2288	915.2
Set Up Costs				
Site Costs	140	140	140	140
Skip Costs	4476	4476	4476	4476
Storage Costs	208	208	208	208
Publicity Costs	0	0	0	0
Crusher Costs	0	0	0	0
TOTAL	4824	4824	4824	4824
SUCPT = SUC/GRT	8.43	21.1	2.1	5.3

Operating Costs	£	%	£	%	£	%	£	%
Collection Costs	3.16	24.9	3.16	15.8	3.16	35.0	3.16	29.1
Site Maintenance	0.15	1.2	0.15	0.7	0.15	1.7	0.15	1.4
Skip Maintenance	2.80	22.0	7.00	34.9	0.70	7.8	1.75	16.1
Administration	0.17	1.3	0.44	2.2	0.04	0.4	0.11	1.0
Publicity	1.92	15.1	4.81	24.0	0.48	5.3	1.20	11.0
Bulk Transport	4.50	35.4	4.50	22.4	4.50	49.8	4.50	41.4
Storage Maintenance	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Crusher Usage	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
TOTAL	12.70	100.0	20.06	100.0	9.03	100.0	10.87	100.0

Gross Operating Costs				
GOPC = OPC * GRT	7264.40	4598.70	20660.60	9948.20
INCOME				
Revenue:				
TRS1	7550.40	3020.20	30201.60	12080.64
TRS4	4118.40	1647.40	16473.60	6589.44
TOTAL	11668.80	4667.60	46675.20	18670.08
Disposal Cost Savings				
SRD = Y * GRT	812.24	324.89	3248.96	1299.60
Collection Cost Savings				
SRC = R * GRT	10868.00	4347.20	43472.00	17388.80
NET EFFECTS				
Private Viability				
PPT(M,W) =	- £0.73	- £20.74	+ £9.26	+ £4.26
Disposal Systems Surplus				
SST(M,W) =	+£0.69	- £19.32	+ £10.68	+ £5.68
Total Systems Surplus				
TST(M,W) =	+£19.68	- £0.32	+ £29.68	+ £24.68

F7.2 Urban Area

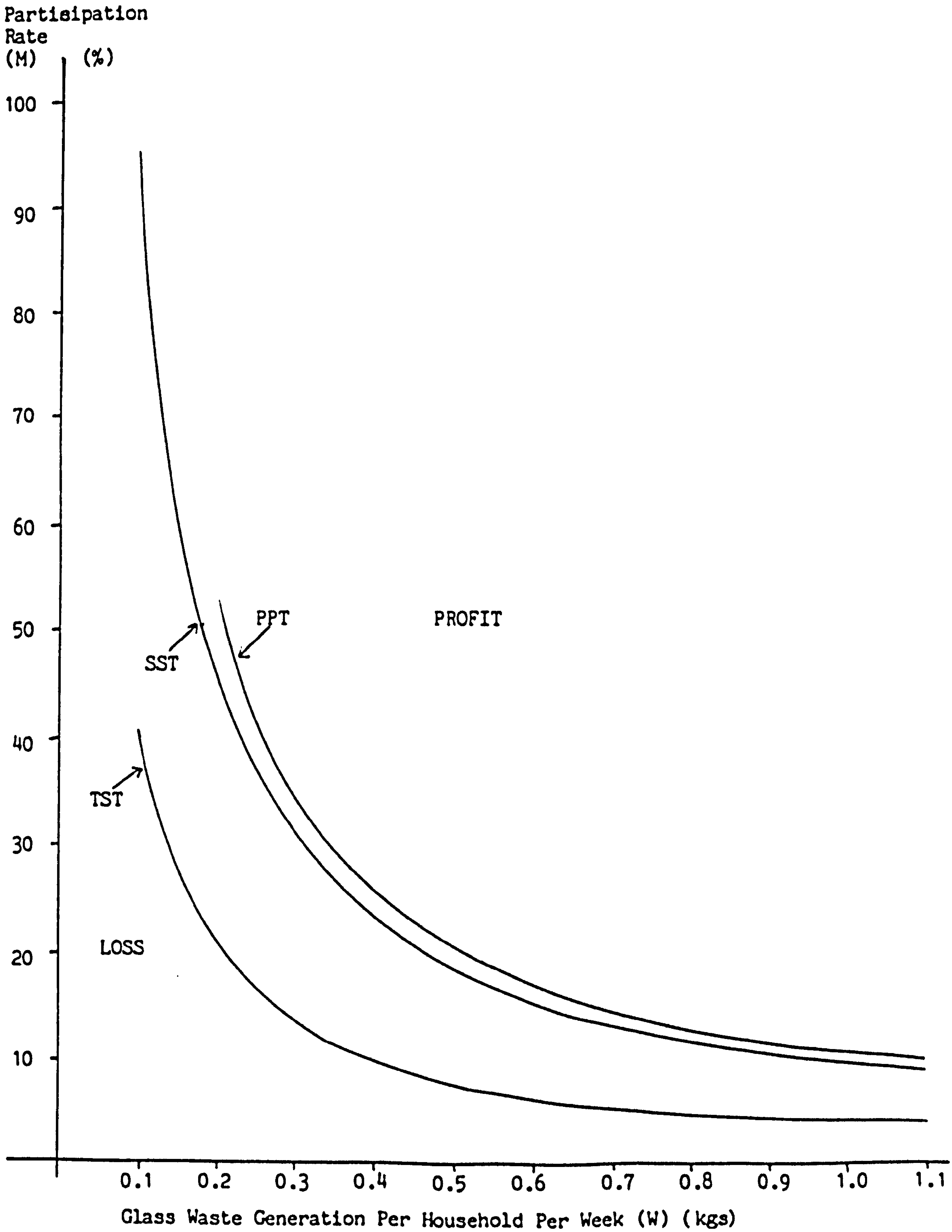
Scenario 1
20 Banks

GRT	VIABILITY MEASURES	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
		WASTE GENERATION W (Kilogrammes)										
606	PPT	-	52/53	34/35	26/27	20/21	17/18	14/15	13/14	11/12	10/11	9/10
520	SST	94/95	47/48	31/32	23/24	18/19	15/16	13/14	11/12	10/11	9/10	8/9
230	TST	40/41	20/21	13/14	10/11	8/9	6/7	5/6	5/6	4/5	4/5	3/4

Scenario 2
8 Banks

GRT	VIABILITY MEASURES	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
		WASTE GENERATION W (Kilogrammes)										
300	PPT	-	26/27	17/18	13/14	10/11	8/9	7/8	6/7	5/6	5/6	4/5
278	SST	48/49	24/25	16/17	12/13	9/10	8/9	6/7	6/7	5/6	4/5	4/5
115	TST	20/21	10/11	6/7	5/6	4/5	3/4	2/3	2/3	2/3	2/3	1/2

FIGURE F7.b Profit/Loss Boundaries (PPT,SST,TST)
For A More Urban Area



F7.3 Expansion

Scenario 1
8 Banks

WASTE GENERATION W (Kilogrammes)

GRT	VIABILITY MEASURES	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
254	PPT	-	50/51	33/34	25/26	20/21	16/17	14/15	12/13	11/12	10/11	9/10
229	SST	-	45/46	30/31	22/23	18/19	15/16	13/14	11/12	10/11	9/10	8/9
100	TST	39/40	19/20	13/14	9/10	7/8	6/7	5/6	4/5	4/5	3/4	3/4

Scenario 2
10 Banks

WASTE GENERATION W (Kilogrammes)

T GRT	VIABILITY MEASURES	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
308	PPT	-	60/61	40/41	30/31	24/25	20/21	17/18	15/16	13/14	12/13	11/12
275	SST	-		36/37	28/29	21/22	18/19	15/16	13/14	12/13	10/11	9/10
110	TST	46/47	23/24	15/16	11/12	9/10	7/8	6/7	5/6	5/6	4/5	4/5

Scenario 3
2 Banks

WASTE GENERATION W (Kilogrammes)

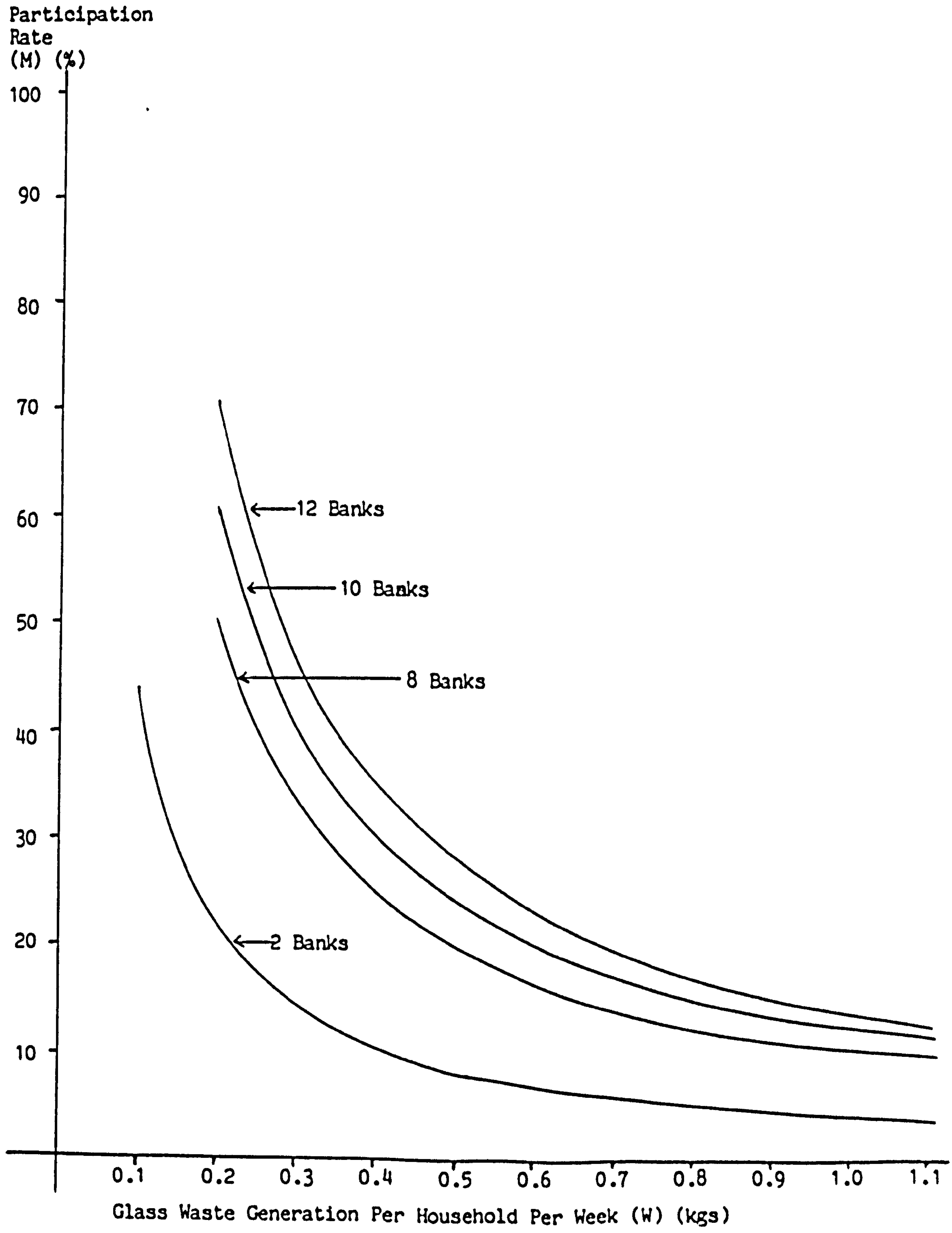
BT GRT	VIABILITY MEASURES	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
110	PPT	43/44	21/22	14/15	10/11	8/9	7/8	6/7	5/6	4/5	4/5	3/4
100	SST	39/40	19/20	13/14	9/10	7/8	6/7	5/6	4/5	4/5	3/4	3/4
42	TST	16/17	8/9	5/6	4/5	3/4	2/3	2/3	2/3	1/2	1/2	1/2

Scenario 4
12 Banks

WASTE GENERATION W (Kilogrammes)

GRT	VIABILITY MEASURES	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1
358	PPT	-	70/71	46/47	35/36	28/29	23/24	20/21	17/18	15/16	14/15	12/13
320	SST	-		42/43	31/32	25/26	21/22	18/19	15/16	14/15	12/13	11/12
132	TST		26/27	17/18	13/14	10/11	8/9	7/8	6/7	5/6	5/6	4/5

FIGURE F7.c Effect Of Expansion On Profit/Loss Boundary (PPT)



Appendix G

Trade Glass Collection Schemes

Appendix G

G.1 Trade Glass Collection Schemes

G.1.1 Introduction

The information presented in this appendix has been brought together from a series of interviews with Council Officers and from a review of the literature available. It outlines the main problems involved in establishing a recovery scheme for trade waste and seeks to illustrate this with real life examples. From this information a Trade Model has been developed to assess the viability of operating a glass collection scheme from trade premises. The model seeks to simplify the system, by emphasising the general characteristics of the system, which can then be modified to assess different objectives (Chapter 11).

G.1.2 Trade Collection Problems

The advantage as with the more conventional Bottle Bank scheme is that at present glass manufacturers offer a guaranteed market for cullet, subject to quality controls. As with the conventional Bottle Bank scheme, there are several closely interrelated problems to evaluate in deciding whether to establish a Trade cullet scheme. These include:

1. Sources of Trade Cullet
2. Type Of Collection Containers Adopted
3. Method of collection
4. Storage of cullet.
5. Transport of cullet.
6. Bulk Transport to cullet plant.
7. Colour separation
8. Whether to use existing Bottle Bank facilities.

Each of the Council schemes examined has approached collection of trade glass in a slightly different way.

G.1.3 Sources Of Trade Cullet

The prime source of cullet is from licensed premises, eg Hotels, Public Houses and Restaurants. A further source of glass is from glaziers - replacement window firms and double glazing firms. The type of glass is different and may warrant a separate collection system - this will be influenced by the quality and the quantity of glass waste produced.

Need information on:

a. The number and distribution of glass producing premises in the Council's area.
b. The amount of glass waste generated from each premises, and whether it is kept separate, until ready for disposal.
c. The type and frequency of existing waste collection/disposal methods.
d. Whether the management and staff would modify their existing arrangements to collaborate with glass collection scheme.

Within Stirling District there are 2247 registered trade premises, of which 249 are catering premises, made up of:

Hotels	105
Public Houses	58
Restaurants	25
Guest Houses	51
Miscellaneous	10
TOTAL	249

Also of importance is knowing the distribution of trade premises within the area, so the optimum collection route can be organised to minimise the distance and maximise the quantity of glass collected. Stirling District has several centres of population, summarised as:

Stirling	60
Bridge of Allan	12
Dunblane	12
Callander	43
Killin	17
Aberfoyle	10
TOTAL	154

This just shows the main centres in the Stirling area. Other areas and premises may be drawn in to a trade collection scheme dependant on the route chosen. Further details of the breakdown of trade premises are shown in Appendix G.2.

Also of importance is the quantity of waste generated by individual trade premises. Falkirk D C have assessed the levels of waste generated by trade premises in their area. Table G.5a shows waste produced by certain premises in the Falkirk area. On average 1.32 tonnes of glass waste is produced by catering premises, ranging from 0.2 tonnes to 5.0 tonnes. However, it shows a large proportion of glass waste is from glaziers, who contributed 470 tonnes of waste glass. Based on the 1.32 tonne figure, Stirling's catering premises could produce up to 330 tonnes of glass per year (ranging from 50 to 1245 tonnes).

G.1.4 Containers For Catering Cullet

The type of containers for which the bar staff and caterers would deposit used glass into for collection will be limited by the overall disposal system and the available storage space. To maximise the response need to minimise extra work to staff and minimise container space.

The container used will be influenced by the collection system adopted. It may not be worthwhile using paladin bins as glass collection containers if only a small proportion of staff are willing to separate glass, or if there is limited storage space available. Storage can be internal or external. If internal limited space can be a problem. If external it influences the size and type of bin to be used and thus the collection system that can be adopted.

One type of container that is cheap (£4-8 each) and convenient to manoeuver are second hand chemical drums of 100-135 litres capacity that will hold about 25 kg of glass and is equipped with a lid and integral handles. Different numbers of containers may therefore be distributed to match glass output from each establishment. It is essential to have a reasonable stock of spares and to mark them with proof of ownership and purpose.

E Lothian use 45 gallon drums, which are modified at a cost of £36 each through the addition of hooks, lifting eyes and a hinged top. This is so they can be collected using the same facilities that are available for the Bottle Bins. The Bottle & Jar Company use modified 45 gallon plastic drums that were previously used as liquid soap barrels. Each collection point has at least two bins, to keep clear and coloured glass separate.

Aberdeen D C use old refuse bins (5' high, 3' diameter) which no longer serve their original purpose. These are modified at a cost of £116 each. Falkirk's collection system is based on the supply of 'spare' refuse bins to the trade premises, which will hold up to 50 to 60lbs of glass. Falkirk have issued 400 bins to 150 premises. Staff are asked not to break the bottles as this will make the bin too heavy to lift. It also avoids the nuisance and potential hazards of broken glass.

With wines, may collect used bottles in the packing cases that they were supplied in. But then would need facilities to separate and collect the cardboard boxes. Aberdeen in their collections from the City Centre collect glass from boxes. Traders put out bottles in cardboard boxes on the morning of collection. A side loader lorry holds 12 hand bins into which bottles are emptied from cardboard boxes. A second lorry follows behind and collects the empty boxes which are also recovered and sold. Initially, both boxes and glass went into one lorry, but as the scheme expanded two lorries are used for the collection of glass and cardboard separately.

Individual Councils need to adopt a standardised system with a regular collection day to facilitate response and reduce the problems of sorting glass out from other trade refuse.

G.1.5 Collection Of Cullet

The method adopted will depend on the vehicle fleet available if it is Council and the container system chosen. There is the option of collecting cullet in the bins or just the cullet. Collecting cullet alone would require the raising of the bin a greater distance to tip it into the vehicle and would necessitate the use of a tipper vehicle thus adding to the cost and reducing the payload. Although requiring a spare set of containers, the cheapest and most flexible method of collection is taking the full bin, therby utilising a flat bed truck.

Aberdeen has two separate collection systems. A city centre route picks up used bottles in cardboard boxes onto a side loader lorry. A bulk lorry collects from 50 premises and is operated by 1 driver and 1 loader. E Lothian also operates two systems of collection. In Musselburgh, a lorry recovers glass from 10 premises each Tuesday and delivers to a storage site. The rest of E Lothian's licensed premises collection is part of the overall glass collection scheme run in the district, with each site being visited once a week.

Falkirk's collection covers the whole of the District. It is operated on set days each week, over two routes. Collection costs are made up of vehicle and labour expenses. Labour comprises 1 driver and two loaders who cost on average £12000 each per annum.

If 20% of their time is taken up by the trade collection, then the scheme needs to account for £7200 in labour costs. Overall vehicle costs are in the order of £7000 per year, which at 20% is £1400 that needs to be costed against the scheme.

G.1.6 Storage Of Cullet

Unless the cullet plant is on the door step there is a need to bulk up several collection loads to provide adequate payload for transport to plant. This can be linked to conventional Bottle Bank facilities.

The expense of building, or renting storage and the necessity of hiring or acquiring a loading shovel may be avoided by off loading glass into skip or other container. This also provides a flexibility in that containers can be sited anywhere, wherever rents are cheapest.

A conventional 6 metre container (cost £1850 with 13 tonne payload) can be loaded direct from collection truck, if cullet brought in by bins. Alternatively, a high sided 10 cu m skip could be utilised (cost £390 to £460 with a 7 tonne payload). If collected cullet has been emptied into a tipper lorry, it will need to be untipped. To avoid expense of mechanical shovel a two tier storage bay would be advantageous as it would enable the glass to be tipped directly into the storage container. This fall from one level to another helps break up the glass and thus reduce the volume, so as to maximise the payload.

Aberdeen use a demountable container from a multi-lift vehicle which can hold about 12 tonnes. The Council makes use of existing vehicles that are used to transport paper bales. The demountable body has a capital cost of £2000 with an 8 year expected life. E

Lothian also use a demountable body of 30 cu yd capacity at a cost of £1800. Again they make use of an existing fleet lorry capacity to move the container. Discharge to storage is from 4' to 5' high, which assists breakage and volume reduction.

The glass in Falkirk is taken to a storage site that was established to serve the Bottle Bank system. So storage costs attributed to trade could be viewed as zero. Alternatively, could assign a proportion of the costs to trade dependant on the quantity of trade to domestic glass stored. In this case 61% of the glass handled by Falkirk is from trade sources and thus 61% of the storage costs could be assigned to the trade scheme.

If rollonoff or skip container is used the distance of cullet plant and competition among transport contractors will be the deciding factor on which option is adopted. There are generally more skip vehicle companies competing for custom and the lower initial costs of skips, or their hire charges means skips should be cost competitive at distance of 70/80km (45-50 miles) from cullet plant.

G.1.7 Colour Separation

There may be the possibility of raising quality specification of mixed cullet to that for green by removing the small proportion of amber and clear bottles. Overall costs need to be offset by increased revenue.

G.1.8 Link To Existing Scheme

Costs such as storage, use of crusher, bulk transport can be reduced if becomes linked with existing glass recovery scheme in local area. Such as conventional Bottle Bank schemes.

Appendix G

G.2 Classification Of Trade Premises In The Stirling Area

TOWN	PUBLIC HOUSES (P)	RESTAURANTS (R)	HOTELS (H)	GUEST HOUSES (G)	TOTAL
ABERFOYLE		2	6	2	10
BALFRON	1		1		2
BALMAHA	1			1	2
BALQUIHIDDER			2	1	3
BANNOCKBURN	4			1	5
BLAIRDRUMMOND		1			1
BLANEFIELD	2		1		3
BRIDGE OF ALLAN	3		8	1	12
BUCHYLVIE		1	1		2
CALLENDER	2	4	21	16	43
COWIE	1				1
CRIANLARICH			1	4	5
DENNY			1		1
DOUNE	1	1	5		7
DRYMEN	1		4		5
DUNBLANE	1	2	8	1	12
FALLIN	2				2
GARTMORE			1	1	2
KILLEARN			1		1
KILLIN	1	1	9	6	17
KIPPEN		1	1	1	3
LOCHEARNHEAD	1		4	1	6
PLEAN	2				2
PORT OF MENTEITH			1		1
STRATHYRE			2	6	8
STIRLING	30	11	12	7	60
STRATHBLANE			1		1
THORNHILL			2		2
TROSSACHS			2		2
WHINS OF MILTON	2				2
TOTALS	55	24	95	49	223

Appendix G

G.3 Aberdeen District Council

G.3.1 Introduction

They operate a Trade Collection scheme for glass as part of their extensive Glass Recycling operation. They established a recycling operation for a number of reasons, including:

Set up as a service.
Recycling activity is important in itself.
See if can afford it.
Glass can damage some of machinery.

Scheme began slowly in 1982 and through advertising has gradually become established. It now collects about 50 tonnes a month, with an overall total so far of 1605 tonnes. The licensed premises collection serves about 50 traders (in addition to 11 centrally located Public sites). The system is served by available spare capacity of the existing Council lorry fleet. Glass is collected on a weekly basis from the premises, over a period of two days each week. This can be substantial with glass making up 30 to 40% of a Public Houses' Trade Waste.

Aberdeen operates two systems of collection:

1. City Centre System
2. Bulk Bin System

G.3.2 City Centre System

This is operated by a Driver and a Loader with a side loader lorry, that goes around the central area collecting the glass from the participating premises. Traders put out bottles in cardboard boxes on the morning of collection. The lorry holds 12 hand bins - and the bottles are emptied from the cardboard boxes into the bins. A second lorry follows on behind and collects the empty boxes which are also recovered and sold. Initially both boxes and glass went into one lorry, but as the scheme expanded they now operate two lorries for the collection.

Quantities Collected between Oct-Dec 1984 was 21 tonnes.

G.3.3 Bulk Bin System

Old refuse bins (5' high, 3' diameter) which no longer serve their original purpose are used; modified at a cost of . 116 each. Any revenue from the scheme goes to the budget for new bins and is used to buy back second hand bins. Normal refuse containers last 10 years, but they are unsure how long they will last in the glass collection scheme. A bulk lorry collects from these premises (50 premises) operated by 1 Driver and 1 Loader. No breakdown of costs is available.

Trade glass is collected free of charge if it is part of the scheme. However, if the glass is excessively contaminated by ordinary refuse then Trade Charges may be levied.

Quantities collected between Oct-Dec 1984 was 93 tonnes.

Total Glass From All Sources Oct-Nov 1984	=	195.3 tonnes
Trade Sources	=	114.0 tonnes
Trade Sources As A Percentage Of Total	=	58.3%

This shows that Trade Collection is the major component of Aberdeen's glass collection system.

G.3.4 Collection

Uplifted glass is taken to a storage site. First it is crushed, conveyed and sorted before being deposited in storage skip. The crusher was cobbled together from existing redundant equipment available at a cost of about £200. Bottles are crushed to reduce volume. Used to use a mechanical shovel pressing down on glass to reduce volume but this was ineffective and caused damage to the skip storage container. Now crushed bottles are fed onto a conveyor where contraries are hand picked off. This is important to maintain quality of delivered product to the glassworks. The broken glass is conveyed to storage container.

Storage consists of a demountable container of a multi-lift vehicle which can hold about 12 tonnes. Council uses existing vehicles that is normally used to transport paper bales (Gross Weight of 24,390 kilogrammes and a carrying capacity of 12,000 kilogrammes). The lorry has a capital cost of £37,000 and the demountable body costs £2,000 and has an 8 year life.

Council lorry bulk transports glass to Alloa, a 240 mile return journey. This takes 1 Driver about 8 hours a full days job. They have found that it is cheaper than hiring a private contractor. This distance is at the limit of those Councils who can reach Alloa. At the moment Council has only a Part Operators License and can only transport own items. If delivery to Alloa becomes more frequent would look at the possibility of back haulage for other goods and would then consider obtaining a Full Operators License.

G.3.5 Benefits

Benefits of the scheme include:

Public Service
Makes a profit
Employs people
Save damage to Treatment Plants - Dano Pulverisation plant
- Baling Plant
Save on Disposal Costs - getting scarce in local area
- not costed
Cut down on accidents to loaders handling plastic sacks.

G.4 East Lothian

At present E Lothian does not charge for Trade Collection. It is a high amenity area - rural, tourism - and looks to move rubbish away from premises quickly and efficiently. They have recently established a new system on a 6 months trial basis. This involves the provision of wheeled bins for Trade Waste (2 types: 240 litre and 120 litre), costing £22 each plus VAT. The Council has modified two lorries to service the scheme, one provides a back-up facility. It operates 4 days a week, but as wheel bins become more extensive will look to reduce this.

Licensed Premises collection is part of overall glass collection scheme. Again there is two distinct systems: 1. Musselburgh route, 2. Bulk Bin Route. The bulk bin route uses 45 gallon oil drums and they will eventually establish a separate run if it becomes extensive enough. A 45 gallon drum costs £36 to convert through the addition of hooks, lifting eyes and a hinged top. Any revenue is funded back into the system to fund more Bottle Bins (cost £380 to £400 each).

Schemes are serviced over two days, each site being visited once per week. Labour costs for two men are approximately £14,000 per annum including bonuses. With lorry costs for repayment and running being about £7,000 per annum. This gives an overall lorry and labour cost for 2 days per wee of £8,400.

In 1984 scheme collected 180 tonnes with a revenue of £3,799. Other benefits will include the use of labour, recycling activity, extension of tip life, treatment plant savings and a reduction in damage to Council lorries.

When initially establishing a glass recovery scheme, the Council was unsure of the response, so GMF set up an operation run by a Private Contractor. As public supported scheme, Council gradually took over with a modular system. Now have three bin types: Hexagonal, Igloo and 45 Gallon Drums.

With a mix of Public access sites and Private sites. Pick-up is by platform lorries. Shall be buying a Dodge with high-up sides and will operate a 'milk-round' system. Glass will be transported to Newhales Cleansing Depot at Musselburgh, where glass is tipped into 30 cu yd demountable body. This has a 10 tonne capacity and is taken to Alloa every 2 weeks. Modular Bins are emptied weekly (Thurs/Fri), with lorries operated by Driver and a Crewman. It has a 7 tonne payload, with 11 tonne gross weight.

Storage costs are about £1800 for 30 cu yd demountable body. Uses identical lorries that move bales. It has a hook arm and tips like normal conventional lorries. Discharge to storage from 4' to 5' high, which assists breakage and volume reduction.

Bulk transport uses existing lorry, costs about £32,000. Has a carrying capacity of 10 tonnes, with a maximum of 12 tonnes. Lorry used is a 3 axle multi-lift equipment, that serves Civic Amenity Sites and private Users of Demountable Bodies. Distance to Alloa is about 60 miles (120 mile return) a 4 hour return journey occupying 1 man every fortnight.

Council also operates a collection around 10 premises in Musselburgh and Tennant on Tuesday. This collects between 10 to 15 cwt of glass per week. Time taken by vehicle, driver and one loader is one and a half hours and costs about £20.84 per week. The glass is again delivered to the storage site at Newhales Depot.

Appendix G

G.5 Falkirk Trade Collection System

G.5.1 Introduction

Falkirk is committed to recycling where feasible. They found in 1984 that at one of their Refuse Transfer Stations they had an under used 3 tonne lorry and a worker available. From this they established a collection round for glass from licensed premises. They had a lot of cooperation from licencees and the scheme expanded to being operated over 5 days covering 6 routes on a rotation basis that took 3 hours each to service. As it was utilising spare capacity they felt that the costs were marginal - primarily extra petrol. On this basis it was felt to be very worthwhile.

G.5.2 Collection

A problem occurred when the worker or vehicle was not available. This lead to a break down in the service and complaints from licencees. The collection system was subsequently reorganised after being transferred from the Disposal Section to the Collection Section. Now, the scheme is operated on two days using one of the refuse vehicles. Again, if it utilises spare capacity the costs will be marginal.

The Trade glass collection service now covers the whole of Falkirk District, servicing every licenced premises (about 150). It is a bonus earning activity, operated on set days over two routes. Thus it will take up to 40% of the vehicles availability, a significant proportion of its time which should be costed against the operation. In 1984 it collected 400 tonnes of glass (8 tonnes per week, approximately 53kg per premises per week).

G.5.3 Collection Containers

The collection system is based on the supply of 'spare' refuse bins to the catering premises. They provide enough bins to cater for a weeks glass waste from each site, provided there is adequate storage space. Each bin holds up to 50 to 60lbs of glass. Some premises will have two bins others will have six. Overall 400 bins have been issued to the 150 premises (on average 2.5 bins per site). Staff are not asked to break the bottles as this will make the bin too heavy to be uplifted. It also avoids the nuisance and potential hazard of broken glass.

Bins are emptied on site into Refuse Collection vehicle (capacity of 7 tonnes). It has a regularised collection round, so that Traders know when it is due.

G.5.4 Collection Costs

Collection costs are made up of labour and vehicle expenses. Labour comprises 1 driver and two loaders who cost on average £12000 per year each. If trade collection uses up 20% of their time, labour costs will be £7200. An existing refuse vehicle is used: Leasing & Depreciation Costs of £4500 (1981), Vehicle Tax & Insurance costs of £799 and Running costs of £950 (1981). Average vehicle costs are £7000 per year. If 20% of the vehicle's time is used, this can be costed at £1400 per year.

G.5.5 Storage

The glass is taken to a storage site which was established to serve the existing Bottle Bank scheme. So storage costs attributable to the trade scheme could be zero. However, it is possible to assign a proportion of the storage costs to the trade scheme. This could be done as a proportion based on use. In Falkirk trade glass makes up 61% of the glass handled. Could assign 61% of the storage costs to the trade scheme.

G.5.6 Bulk Transport

In either storage case, the trade system will still be faced with loading and bulk transport costs. Loading a vehicle will take one man about half an hour. Transport is a bonus earning activity. It takes 1 driver about 1.5 hours to deliver glass to the processor. This is about 4% of driver's normal activities. If labour costs are £12000 and vehicle costs £7000, attributable costs are £480 and £280 respectively.

G.5.7 Income

Income derived from the sale of cullet is £18.5 per tonne, a return of £7400 per annum on 400 tonnes of glass collected. Other affects are changes in quantity of trade waste collected and possible disposal savings.

G.5.8 Summary

The basic factors are illustrated in Table GF.1. Overall, if collection costs are included it does not cover its costs. But if it is utilising spate capacity these costs would be marginal/zero and the scheme would 'cover' its costs. Again it shows that trade collections are the main component of glass waste recovered (400/600 = 61%).

TABLE GF.1 Breakdown Of Falkirk Trade System

		Number	Cost (£)	Trade Use	Cost (£)
Skip Provision					
Refuse Bins		400			
Replacement/Maintenance		-	-	-	-
Storage Costs					
Capital Costs				61%	
Maintenance					
Loading					
Collection					
Labour:	Driver	1	12000	20%	2400
	Loaders	2	12000	20%	4800
Vehicle:	Standing Costs	1	= 4500	20%	900
	Operating Costs		= 3000	20%	600
TOTAL					8700
Bulk Transport					
Labour:	Driver	1	=12000	4%	480
Vehicle:		1	= 7000	4%	280
Total Costs					9640
Income					
Revenue: @400*18.5=					7400
					-2060
Disposal Savings: @400*1.42=					568
					-1492
Changes In Trade Revenue:					?

If assume Collection Costs are marginal/zero: Net Benefit =£6640

		[illegible]	[illegible]	ALL	RECYCLED WASTE
0536	CELLULOSE WASTE	250000.00	RICHARD I RACKE LTD	NONE	LANDFILL DIRECT
	CELLULOSE WASTE	7463350.00			
0050	GLASS	140000.00	KIRK GLASS (GEORGE G KIRK LTD)	NONE	LANDFILL DIRECT
0051	GLASS	72000.00	KIRK GLASS (GEORGE G KIRK LTD)	ALL	RECYCLED WASTE
0052	GLASS	24000.00	FALKIRK GLAZING CO	NONE	LANDFILL DIRECT
0053	GLASS	24000.00	FALKIRK GLAZING CO	ALL	RECYCLED WASTE
0059	GLASS	60000.00	ROBERT BARR LTD	ALL	RECYCLED WASTE
0158	GLASS	5000.00	HUGH GRAY	NONE	LANDFILL DIRECT
0316	GLASS	18000.00	R & G GLAZING	ALL	RECYCLED WASTE
0538	GLASS	6000.00	CENTRAL ALUMINIUM STRUCTURES LTD	NONE	LANDFILL DIRECT
0545	GLASS	30000.00	ALVA GLASS LTD	NONE	LANDFILL DIRECT
0600	GLASS	5000.00	WM Y WILSON	ALL	RECYCLED WASTE
0604	GLASS	60000.00	FORTH GLAZING CO LTD	NONE	LANDFILL DIRECT
0577	GLASS	30000.00	IMPERIAL CHEMICAL INDUSTRIES LTD	NONE	LANDFILL DIRECT
0634	GLASS	600.00	POWFOULIS MANOR HOTEL	ALL	RECYCLED WASTE
0691	GLASS	1250.00	HOTEL CLADHAN	ALL	RECYCLED WASTE
0697	GLASS	1250.00	PLOUGH HOTEL	ALL	RECYCLED WASTE
0699	GLASS	4000.00	STATION HOTEL	ALL	RECYCLED WASTE
0702	GLASS	650.00	TORWOODLEA HOTEL	ALL	RECYCLED WASTE
0709	GLASS	2600.00	NORWOOD HOTEL	ALL	RECYCLED WASTE
0714	GLASS	1300.00	INCHYRA GRANGE HOTEL	ALL	TRANSFER TO LANDFILL
0716	GLASS	500.00	POLMONTBANK HOTEL	ALL	TRANSFER TO LANDFILL
0719	GLASS	300.00	GORDON ARMS HOTEL	ALL	RECYCLED WASTE
0721	GLASS	350.00	GLENSKIRLIE HOUSE	ALL	RECYCLED WASTE
0724	GLASS	2600.00	THE THREE KINGS	ALL	RECYCLED WASTE
0731	GLASS	650.00	WHYTESIDE HOTEL	ALL	RECYCLED WASTE
0733	GLASS	650.00	BLACK BULL	ALL	RECYCLED WASTE
0741	GLASS	600.00	STATION HOTEL	ALL	RECYCLED WASTE
0745	GLASS	300.00	COMMERCIAL HOTEL	ALL	RECYCLED WASTE
0749	GLASS	200.00	RED LION HOTEL	ALL	RECYCLED WASTE
0750	GLASS	1300.00	CROWN INN	ALL	RECYCLED WASTE
0753	GLASS	1250.00	SPORTSMAN'S BAR	ALL	RECYCLED WASTE
0755	GLASS	300.00	THE FORGE RESTAURANT	ALL	RECYCLED WASTE
0759	GLASS	300.00	THE COPPER TOP		RECYCLED WASTE
0761	GLASS	1300.00	THE HURLET	ALL	RECYCLED WASTE
0764	GLASS	5000.00	UNION INN	ALL	RECYCLED WASTE
0767	GLASS	2600.00	THE CROSSBOW	ALL	RECYCLED WASTE
0771	GLASS	600.00	ROYAL HOTEL	ALL	RECYCLED WASTE
0774	GLASS	1300.00	THE PINES	ALL	RECYCLED WASTE
0779	GLASS	600.00	THE ROMAN BAR	ALL	RECYCLED WASTE
	GLASS	506350.00			
0332	OTHER INDUSTRIAL WASTE	50,000.00	D MORRISON & SONS LTD	[illegible]	[illegible]

G.6 Private Trade Glass Collection Schemes

G.6.1 London Borough of Westminster

The Trade collection scheme in Westminster City Council established by the private company Culglow Ltd in Summer 1984 collapsed at the end of December 1984 (MRW 19 January 1985). Culglow approached a number of licensed premises in the Soho, Covent Gardens, St James' and Mayfair areas with a view of establishing a glass collection scheme from trade sources. Culglow invested in 500 bins which each hold about 60 bottles and positioned 150 bins in Soho and 150 in Covent Garden (Kelliebank Newsletter October 1984 No 56). The bins were marked with the company's name and address and their purpose. The bins were collected between 11.00pm and 07.00am replacing them with empty bins. The idea was that full bins could be emptied into a larger vehicle away from centres of population to avoid the noise problem and then glass is transported to Harlow. They were also looking for a permanent depot where glass can be stored and separated into colours.

Culglow arranged with Harlow for the payment of £26.50 for each tonne of clear glass and £20.50 for mixed glass delivered to the processor. Culglow also believed that Westminster City Council would pay £7.50 per tonne from the savings in disposal costs received from Greater London Council. This would have allowed expansion of scheme and the employment of more operatives.

This payment must be paid via the collection authority and for glass collection schemes to qualify they must have official status with the local Borough. Culglow did not receive the rebate, as

Westminster claimed that the Council could not be sure that tonnages had come from its waste disposal area and so could not become involved in paying rebates to the collector.

Culglow initially collected 25 tonnes a week and felt that 40 to 50 tonnes a day was available. In the first month of operations they ran into a number of problems, with marked bins disappearing and collection reduced to 14 tonnes per month. The company claimed that Dustbin men were removing bins. They claim to have lost 200 bins, resulting in a loss of £17,000. Culglow tried to counter disappearance of bins, by collecting glass before the dustbin men arrived. This was done by a pantechnicon with bins being emptied on site, but this caused a noise nuisance to local residents. This forced the company to withdraw the service in which they had invested £0.5 million.

A factor was the response of Council employees to the new scheme. Westminster dustbin men are paid on a basis that takes into account the number of premises visited, work load and the volume of waste collected. If a substantial percentage of glass was collected from Westminster by another collector this would affect the bonus taken by the dustbin men. The council had considered it unnecessary to review the dustbin men's salary structure as a result of instituting a glass recycling scheme. Applying Trade Waste charges would not appear to offer a simple solution, as Westminster only imposes trade waste charges at weekends and says that dumping increases as a result.

Re-establishment

(Anon 1985) Westminster City Council are to establish a new glass recycling scheme, with a £20,000 starter budget to defray costs.

There are to be separate schemes operating for commercially and domestically arising cullet.

The City's own refuse collectors would be used to operate the commercial glass collection scheme from licensed premises in Soho, Covent Garden and St James. The plan was to send out two collection vehicles together with the glass collection vehicle travelling slightly ahead of general trade waste vehicle to lower noise nuisance to residents. City Council would provide bottle collecting receptacles for those premises that required them although some collection would be done through cardboard boxes.

G.6.2 Glasgow Trade Collection Scheme

The Bottle & Jar Disposal Company set up to collect waste glass from wine bars, public houses, hotels and restaurants. It started in October 1984 and by February 1985 had 400 containers on site servicing 80 licensed premises, collecting 10 tonnes per week (Kelliebank Newsletter February 1985 No 60). They aim to be collecting 40 tonnes per week by March 1985.

In establishing the scheme they approached the main Breweries - Tennents, Drybroughs. There was a good response from them, partly as it is good public relations for them and because the scheme saves money. Some licencees claim to have made savings of £30 per week on refuse sacks. Traders in Glasgow pay £14.50 for a pack of 50 sacks, with reduced rates for larger orders.

The Company uses modified 45 gallon plastic drums, that were previously used as liquid soap barrels. Each collection point has at least two bins, to keep clear and coloured glass separate. Bins are emptied once a week, being lifted manually onto one of the company's two small trucks. The glass is taken to the company's premises at Yorkhill Quay where it is stored before being crushed and transhipped to Alloa. They currently use a contract skip hire company to move glass to Alloa, but in long term plan to undertake this aspect of the operations themselves.

They have since transferred operations to United Glass' depot at Cook Street in Glasgow and aim to expand to cover the whole of Scotland in the future.

Benefits to licencee: Reduction in Trade Costs
Less hazards from broken glass in sacks
Cleaner premises.

The scheme ran into problems and ceased operations in Dec 1985

Table 11H.1 Breakdown Of Bottle & Jar Disposal Company's Operations

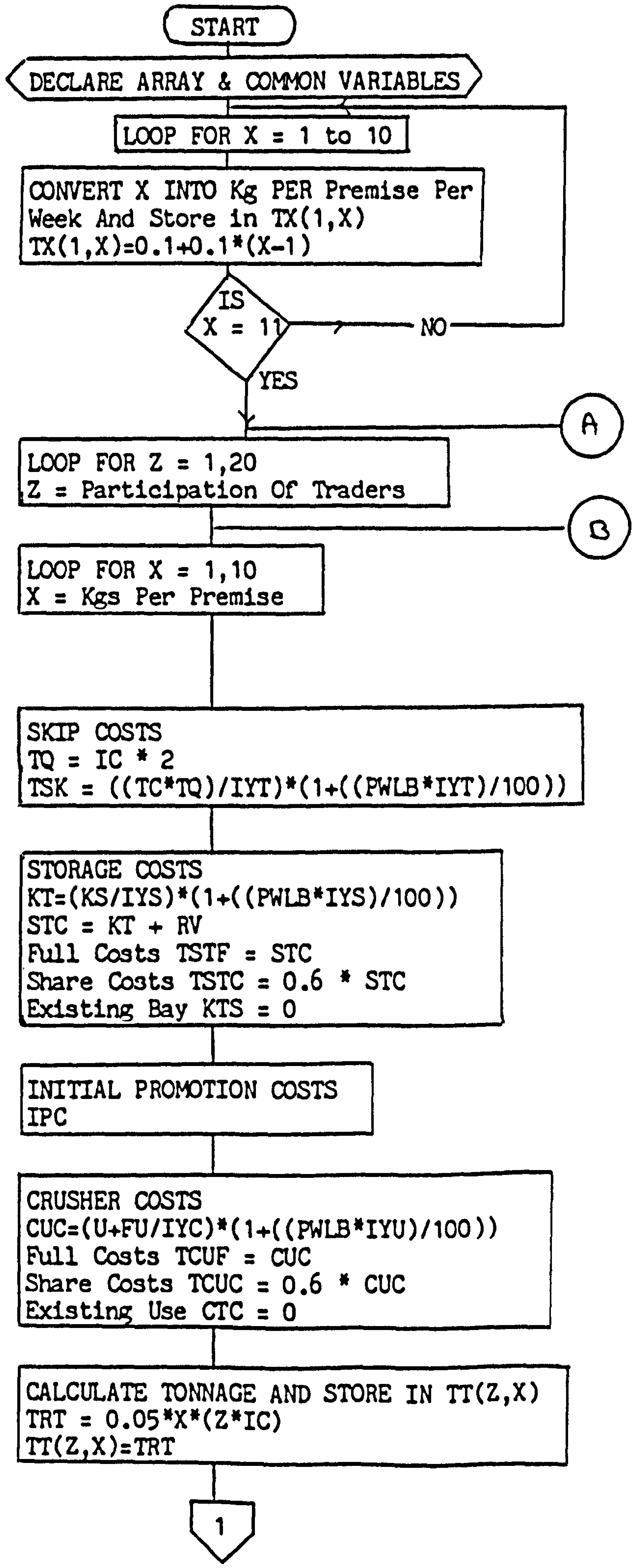
Collects from 80 premises
using 400 containers

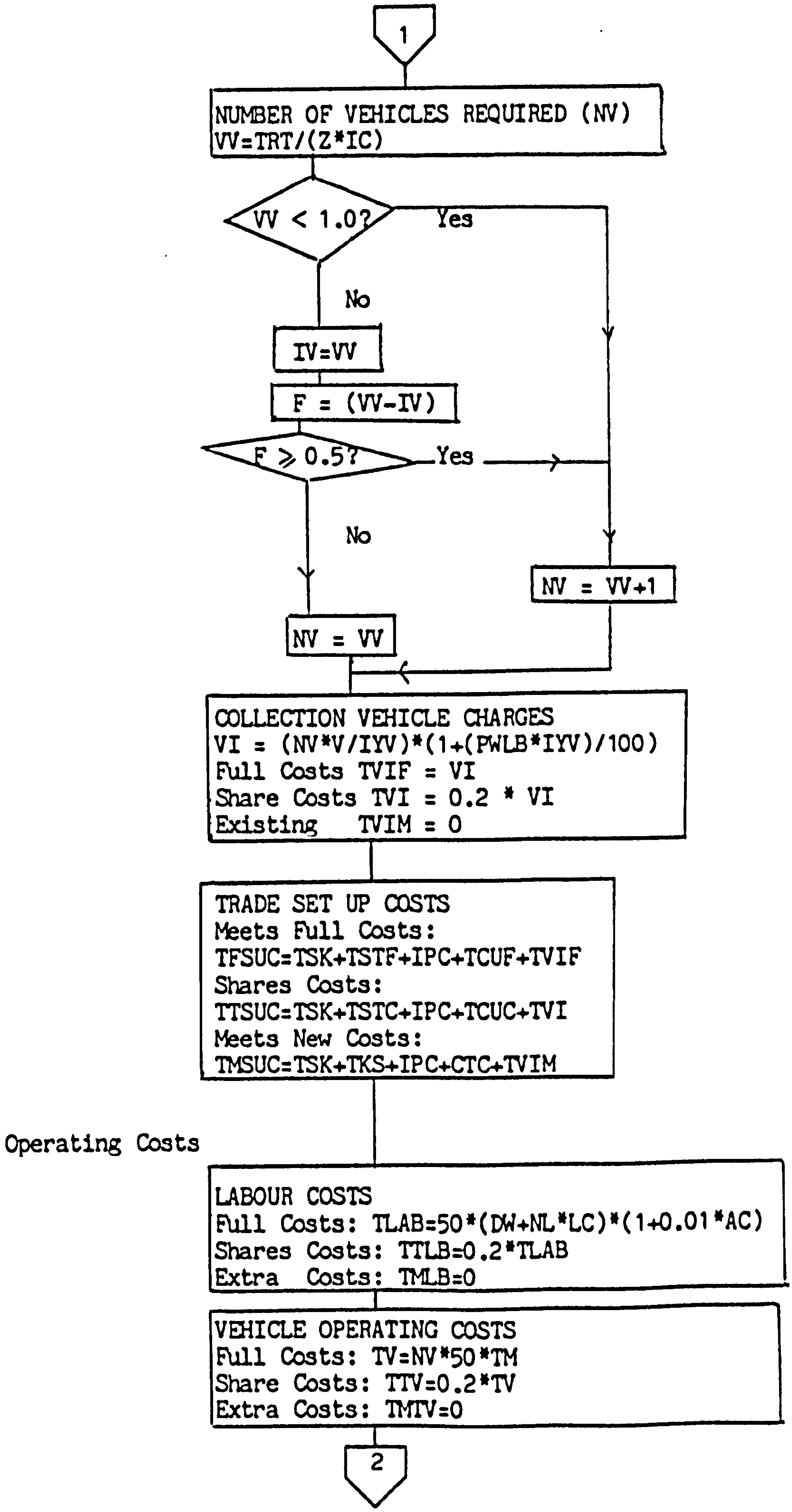
10 tonnes per week collected

		Costs (£)	2 Days/Wk	5 Days
Skip Provision				
Bins	400			
Storage				
Collection				
Labour:	2 Men	= £6000	£1200	£6000
Vehicle: (3 tonne)		= £3000	£600	£3000
Crusher				
Capital				
Operating				
Bulk Transport				
Contract: @ £4/tonne * 500 tonnes			£2000	£2000
TOTAL COSTS			£3800	£9250
Income				
Revenue: @£18.5 * 500			£9250	£9250
Profit/Loss			+£5450	-£1750

SUBROUTINE TRADE

Set Up Costs




1
NUMBER OF VEHICLES REQUIRED (NV)
VV=TRT/(Z*IC)
VV < 1.0?
Yes
No
IV=VV
F = (VV-IV)
F ≥ 0.5?
Yes
No
NV = VV+1
NV = VV
COLLECTION VEHICLE CHARGES
VI = (NV*V/IYV)*(1+(PWLB*IYV)/100)
Full Costs TVIF = VI
Share Costs TVI = 0.2 * VI
Existing TVIM = 0
TRADE SET UP COSTS
Meets Full Costs:
TFSUC=TSK+TSTF+IPC+TCUF+TVIF
Shares Costs:
TTSUC=TSK+TSTC+IPC+TCUC+TVI
Meets New Costs:
TMSUC=TSK+TKS+IPC+CTC+TVIM
Operating Costs
LABOUR COSTS
Full Costs: TLAB=50*(DW+NL*LC)*(1+0.01*AC)
Shares Costs: TTLB=0.2*TLAB
Extra Costs: TMLB=0
VEHICLE OPERATING COSTS
Full Costs: TV=NV*50*TM
Share Costs: TTV=0.2*TV
Extra Costs: TMTV=0
2

2

SKIP MAINTENANCE
TSKM=0

ADMINISTRATION
TA=0

ON-GOING PROMOTION
TPUB=0

CRUSHER OPERATING COSTS
COC=50*(CLC+CNL)*(1+0.01*AC)
Full Costs: CLAB=COC
Shares Costs: TCLB=0.2*CLAB
Extra Costs: TCMB=0

CRUSHER SUPPLIES & SERVICES
CSS=CSPT*(0.05*Z*IC)
Full Costs: CSC=CSS
Shares Costs: TCSC=0.2*CSS
Extra Costs: TCMC=0

STORAGE MAINTENANCE
TSTM=WS*TS

BULK TRANSPORT
TBTR = (TR+TL)*TRT

TOTAL TRADE OPERATING COSTS
Meets Full Costs:
TFOPC=TLAB+TV+TSKM+TA+TPUB+CLAB+CSC+TSTM+TBTR
Shares Costs:
TTOPC=TTLB+TTV+TSKM+TA+TPUB+TCLB+TCSC+TSTM+TBTR
Meets Extra Costs
TMOPC=TMLB+TMTV+TSKM+TA+TPUB+TCMB+TCMC+TSTM+TBTR

Income

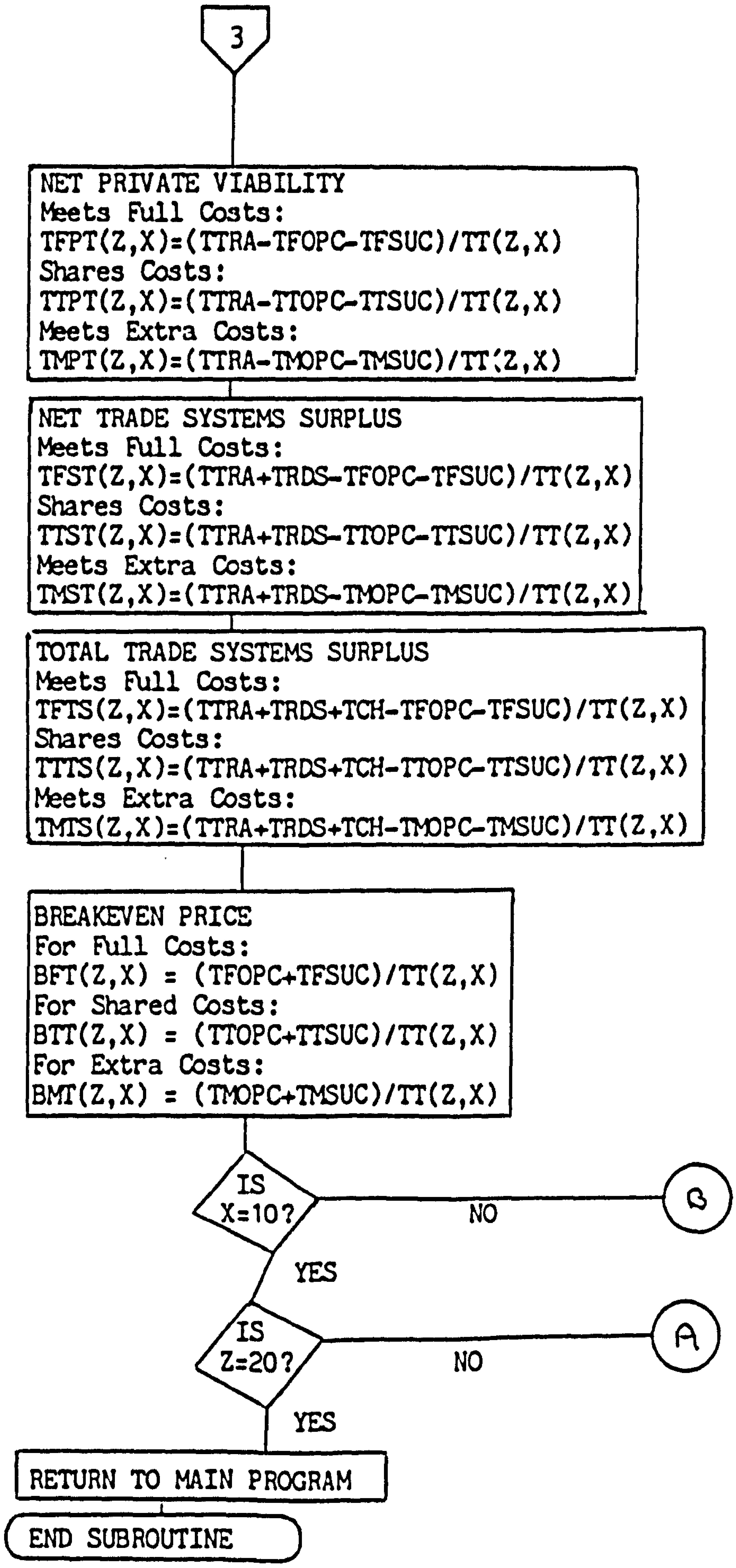
REVENUE
TTRA=TTP1+TTP2+TTP3+TTP4

CHANGES IN TRADE COLLECTION COSTS
Savings In Trade Collection Costs
SCT=TB*TRT
Loss In Trade Revenue
LTR=TD*TRT
TCH=SCT-LTR

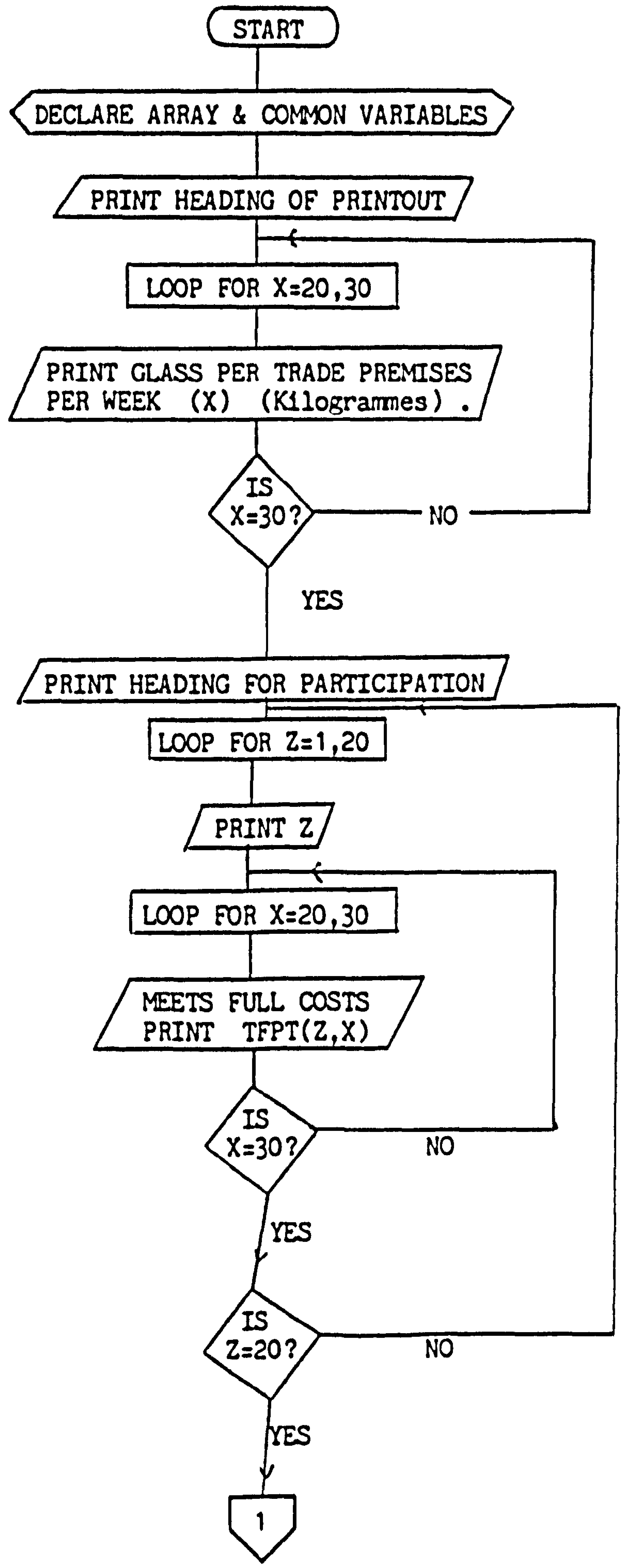
SAVINGS IN REFUSE DISPOSAL COSTS
TRDS = Y*TRT

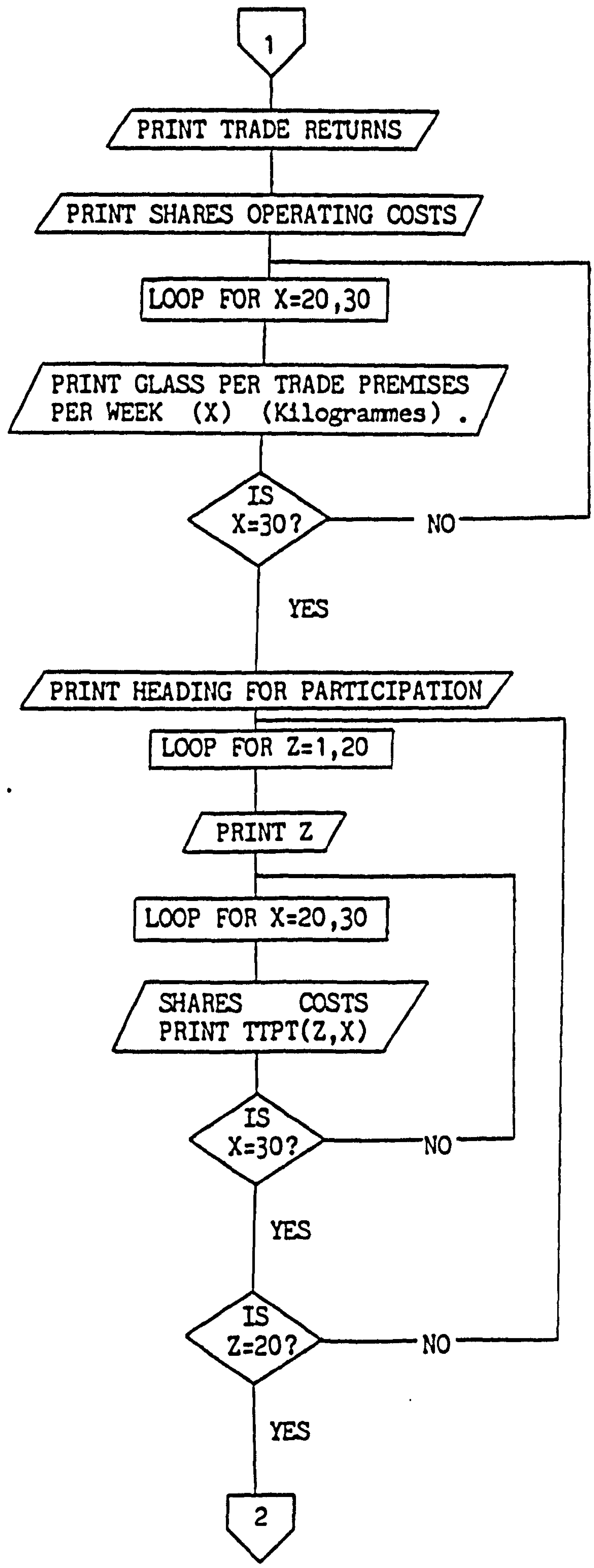
3

Net Costs


3
NET PRIVATE VIABILITY
Meets Full Costs:
TFPT(Z,X)=(TTRA-TFOPC-TFSUC)/TT(Z,X)
Shares Costs:
TTPT(Z,X)=(TTRA-TTOPC-TTSUC)/TT(Z,X)
Meets Extra Costs:
TMPT(Z,X)=(TTRA-TMOPC-TMSUC)/TT(Z,X)
NET TRADE SYSTEMS SURPLUS
Meets Full Costs:
TFST(Z,X)=(TTRA+TRDS-TFOPC-TFSUC)/TT(Z,X)
Shares Costs:
TTST(Z,X)=(TTRA+TRDS-TTOPC-TTSUC)/TT(Z,X)
Meets Extra Costs:
TMST(Z,X)=(TTRA+TRDS-TMOPC-TMSUC)/TT(Z,X)
TOTAL TRADE SYSTEMS SURPLUS
Meets Full Costs:
TFTS(Z,X)=(TTRA+TRDS+TCH-TFOPC-TFSUC)/TT(Z,X)
Shares Costs:
TTTS(Z,X)=(TTRA+TRDS+TCH-TTOPC-TTSUC)/TT(Z,X)
Meets Extra Costs:
TMTS(Z,X)=(TTRA+TRDS+TCH-TMOPC-TMSUC)/TT(Z,X)
BREAKEVEN PRICE
For Full Costs:
BFT(Z,X) = (TFOPC+TFSUC)/TT(Z,X)
For Shared Costs:
BTT(Z,X) = (TTOPC+TTSUC)/TT(Z,X)
For Extra Costs:
BMT(Z,X) = (TMOPC+TMSUC)/TT(Z,X)
IS X=10?
NO
B
YES
IS Z=20?
NO
A
YES
RETURN TO MAIN PROGRAM
END SUBROUTINE

SUBROUTINE TRADING

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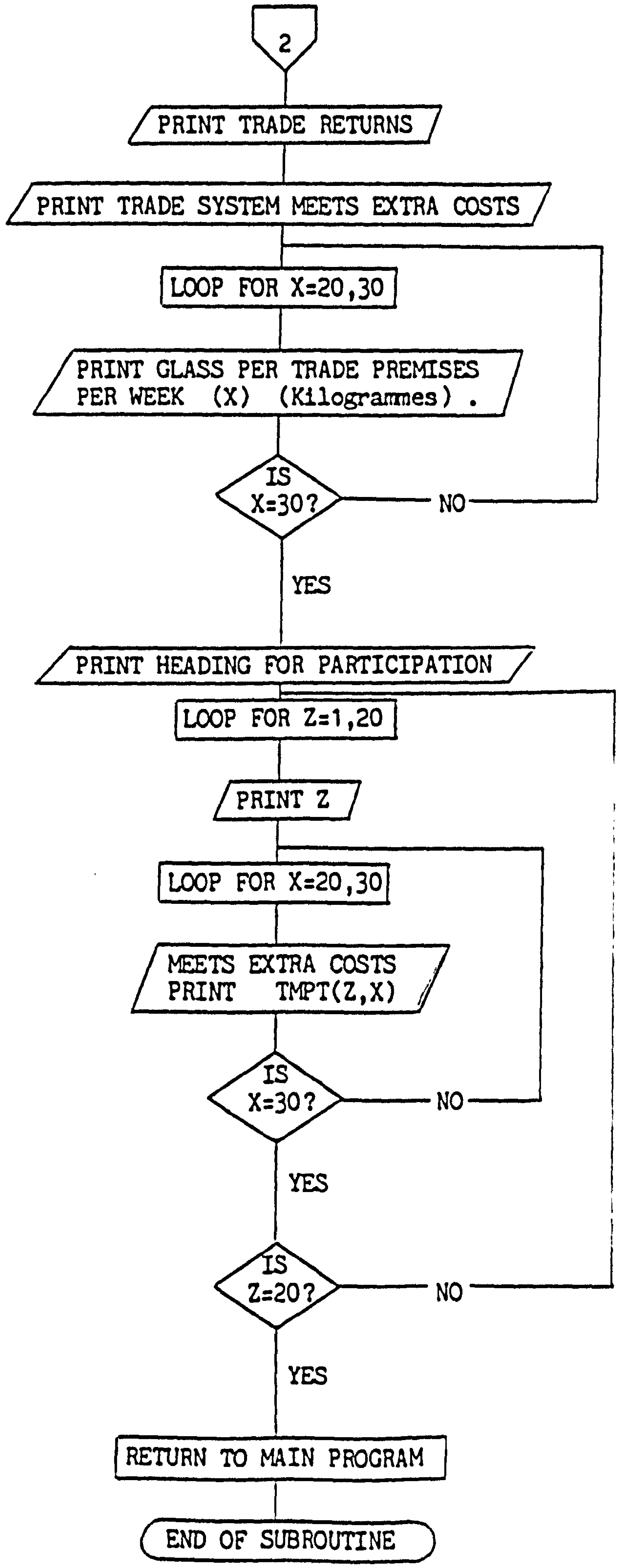
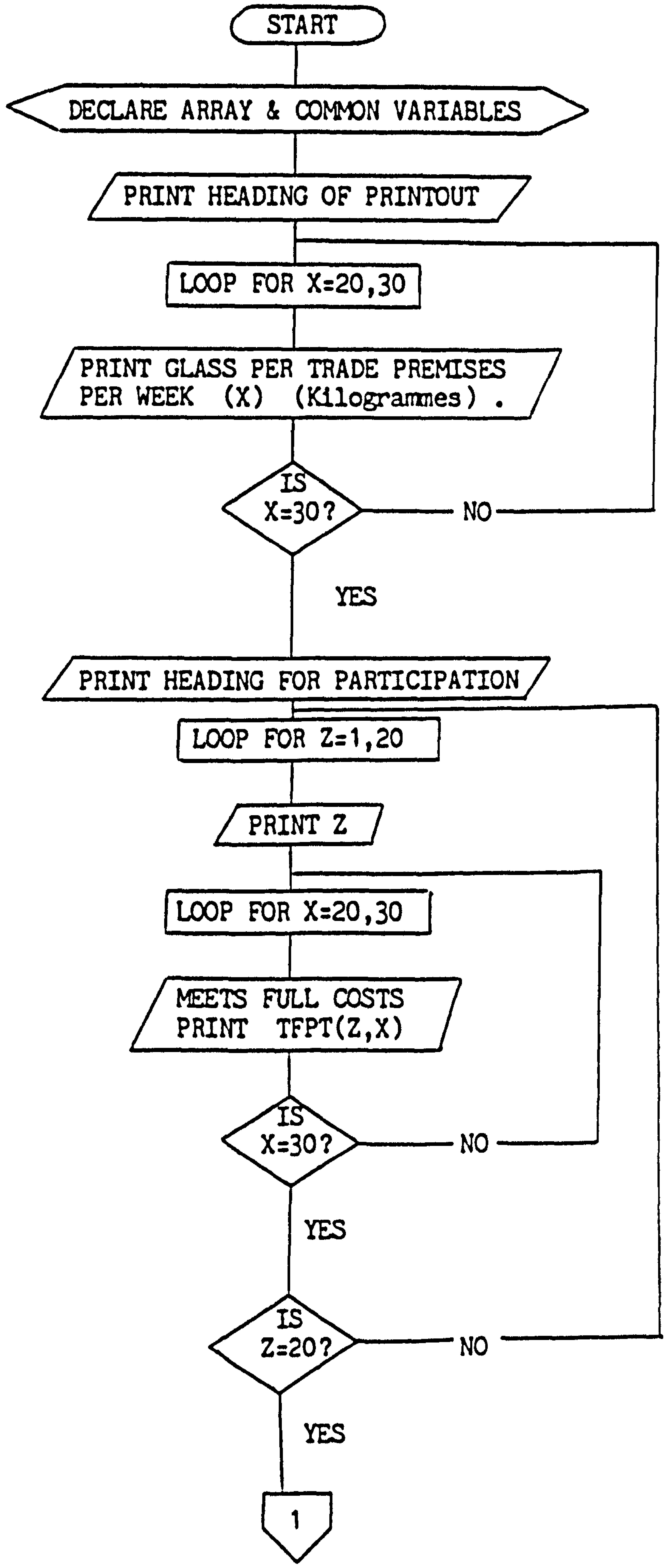
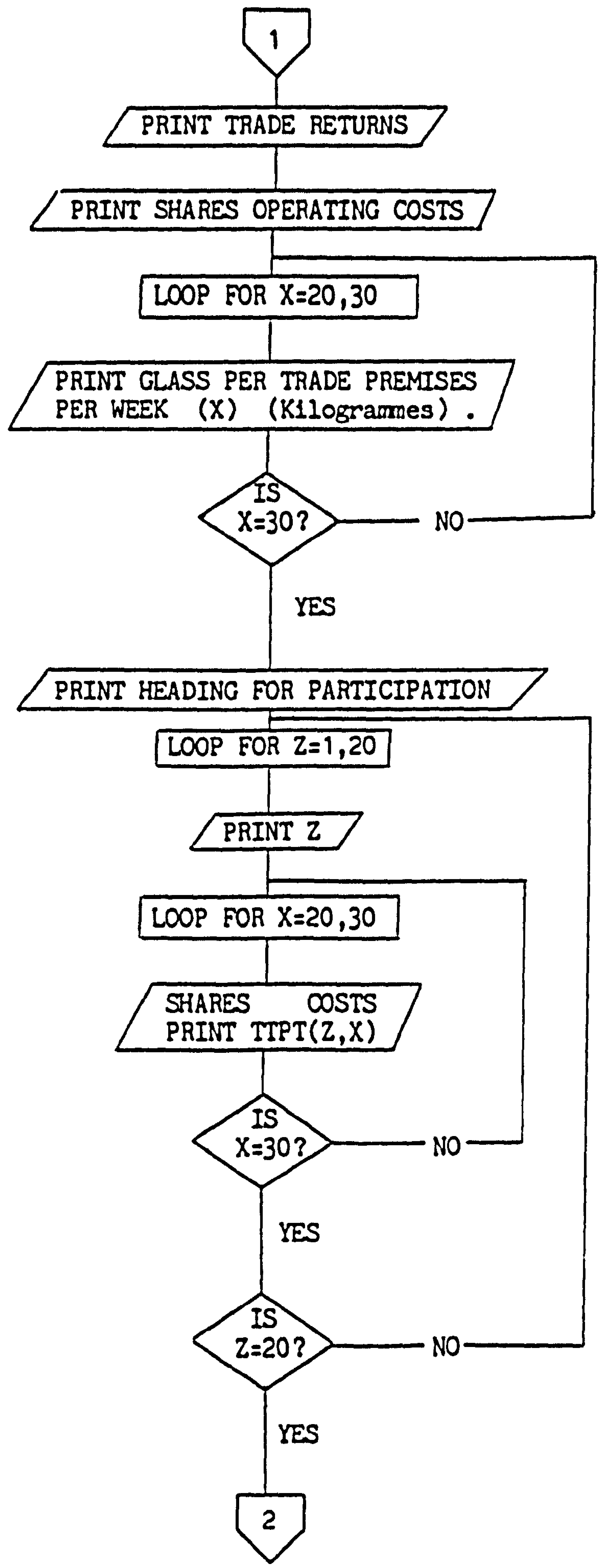
PRINT TRADE RETURNS
PRINT SHARES OPERATING COSTS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES PER WEEK (X) (Kilogrammes) .
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,20
PRINT Z
LOOP FOR X=20,30
SHARES COSTS
PRINT TTPT(Z,X)
IS X=30?
NO
YES
IS Z=20?
NO
YES
2

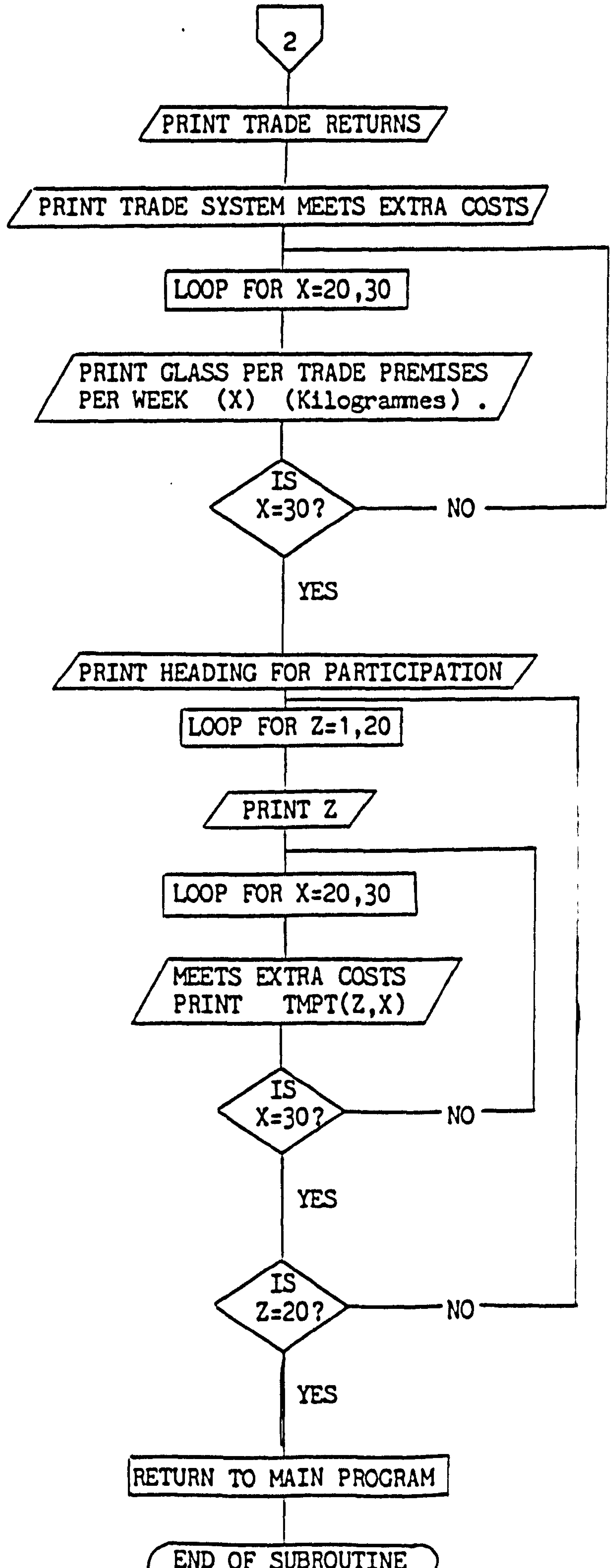

2
PRINT TRADE RETURNS
PRINT TRADE SYSTEM MEETS EXTRA COSTS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES PER WEEK (X) (Kilogrammes) .
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,20
PRINT Z
LOOP FOR X=20,30
MEETS EXTRA COSTS PRINT TMPT(Z,X)
IS X=30?
NO
YES
IS Z=20?
NO
YES
RETURN TO MAIN PROGRAM
END OF SUBROUTINE

SUBROUTINE TRADING





1
PRINT TRADE RETURNS
PRINT SHARES OPERATING COSTS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES PER WEEK (X) (Kilogrammes) .
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,20
PRINT Z
LOOP FOR X=20,30
SHARES COSTS PRINT TTPT(Z,X)
IS X=30?
NO
YES
IS Z=20?
NO
YES
2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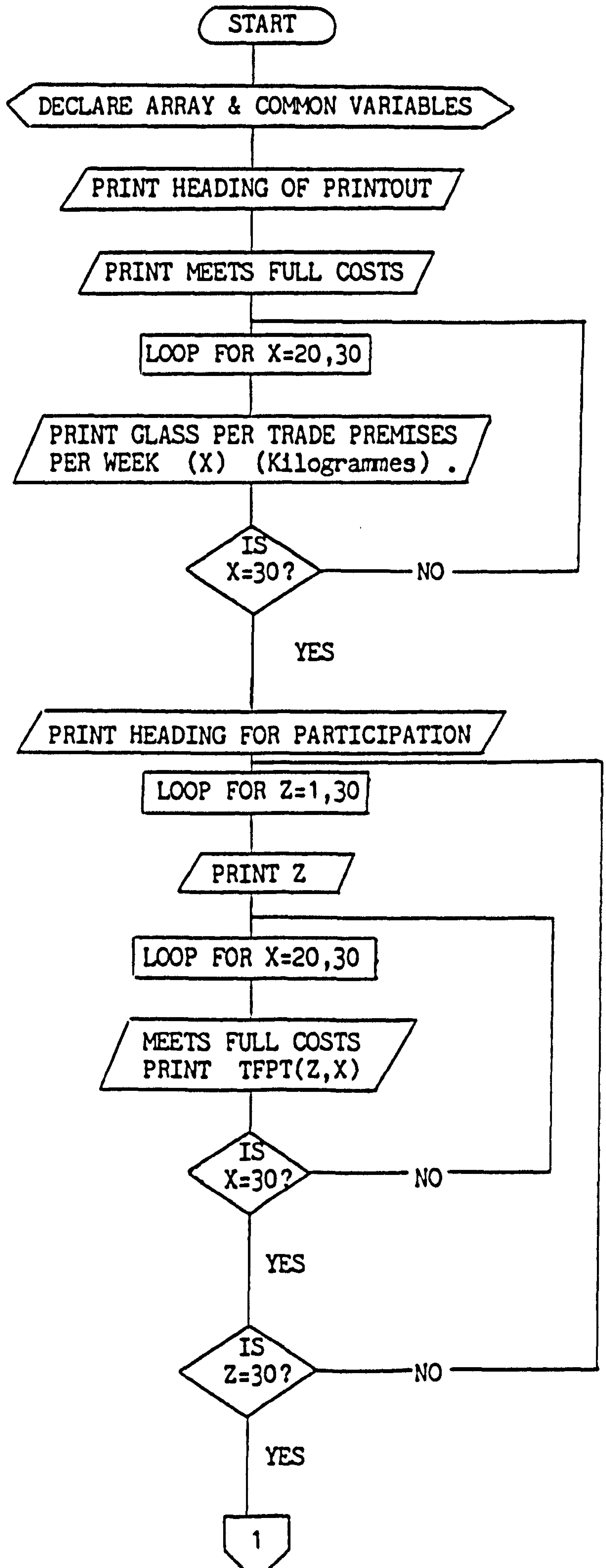
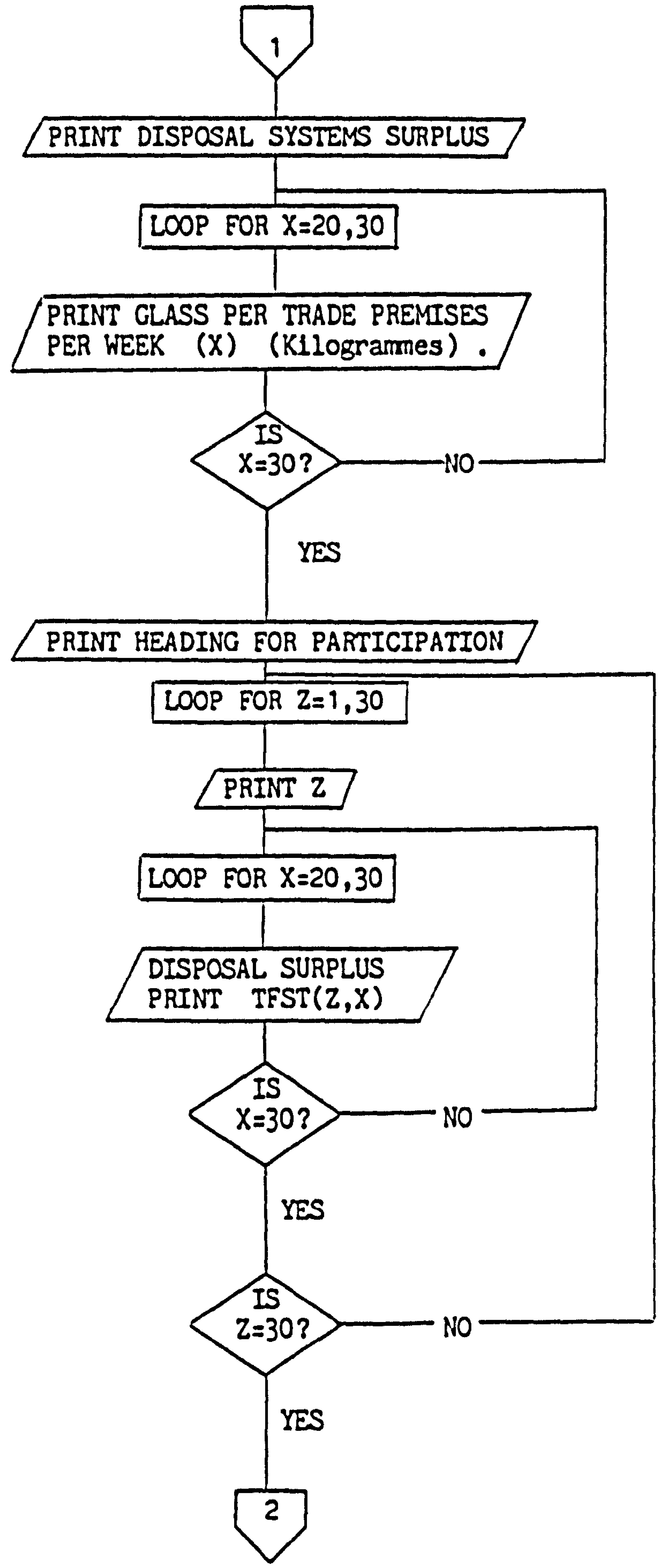
PRINT TRADE RETURNS
PRINT TRADE SYSTEM MEETS EXTRA COSTS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES
PER WEEK (X) (Kilogrammes) .
IS
X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,20
PRINT Z
LOOP FOR X=20,30
MEETS EXTRA COSTS
PRINT TMPT(Z,X)
IS
X=30?
NO
YES
IS
Z=20?
NO
YES
RETURN TO MAIN PROGRAM
END OF SUBROUTINE

SUBROUTINE TRDFULL

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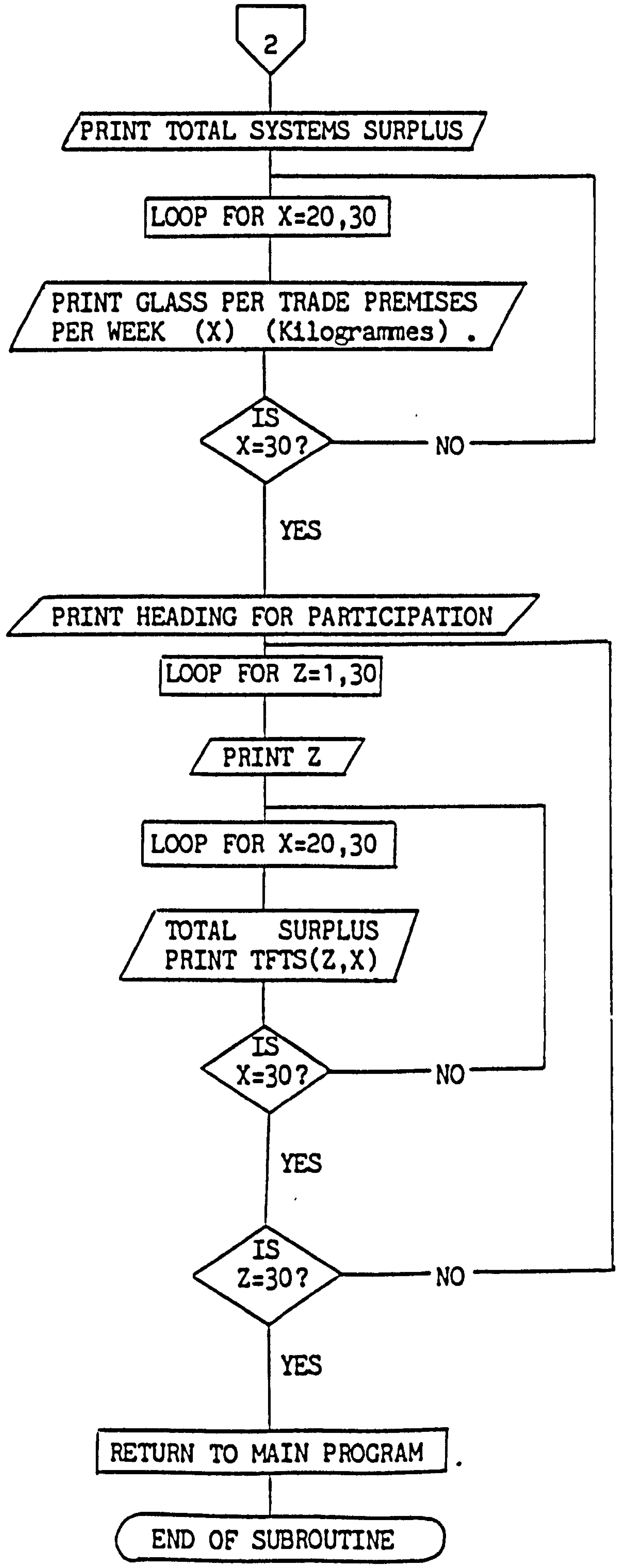
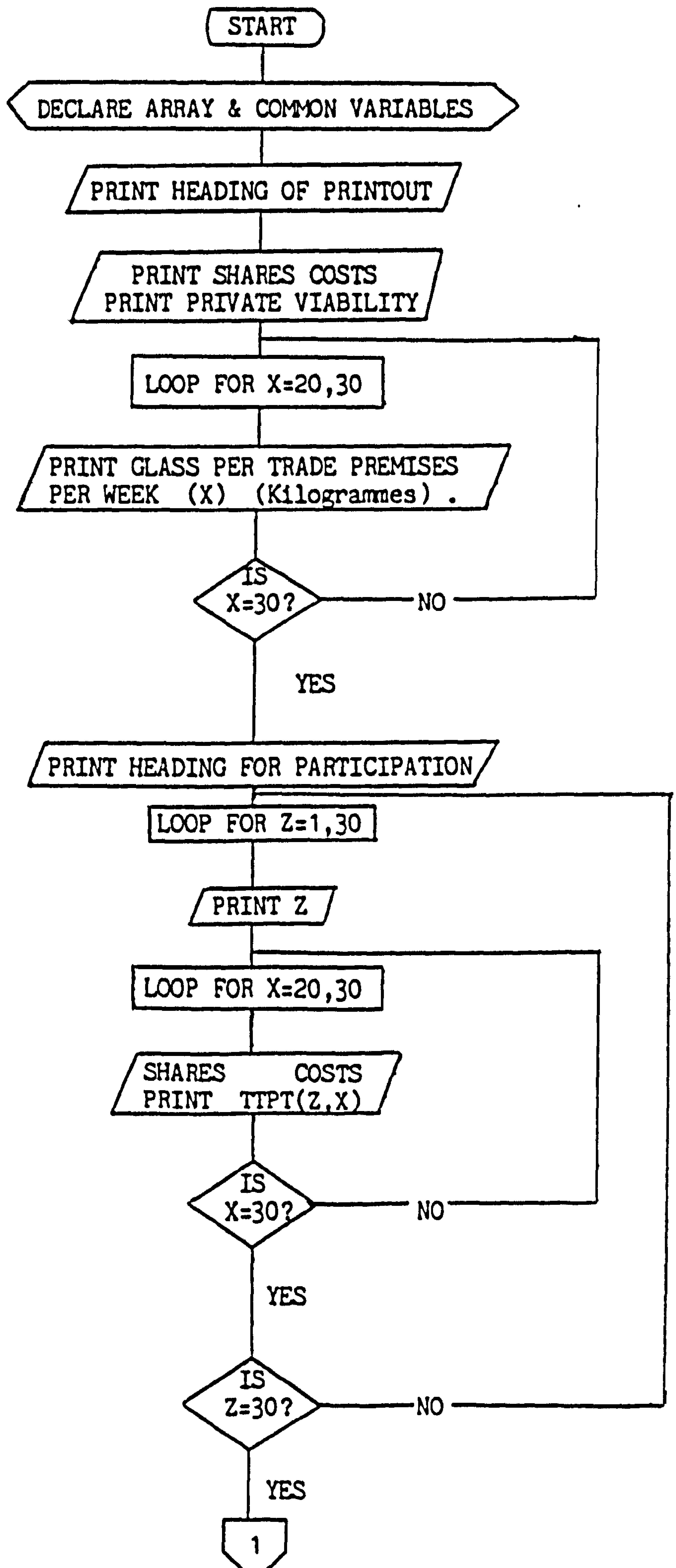
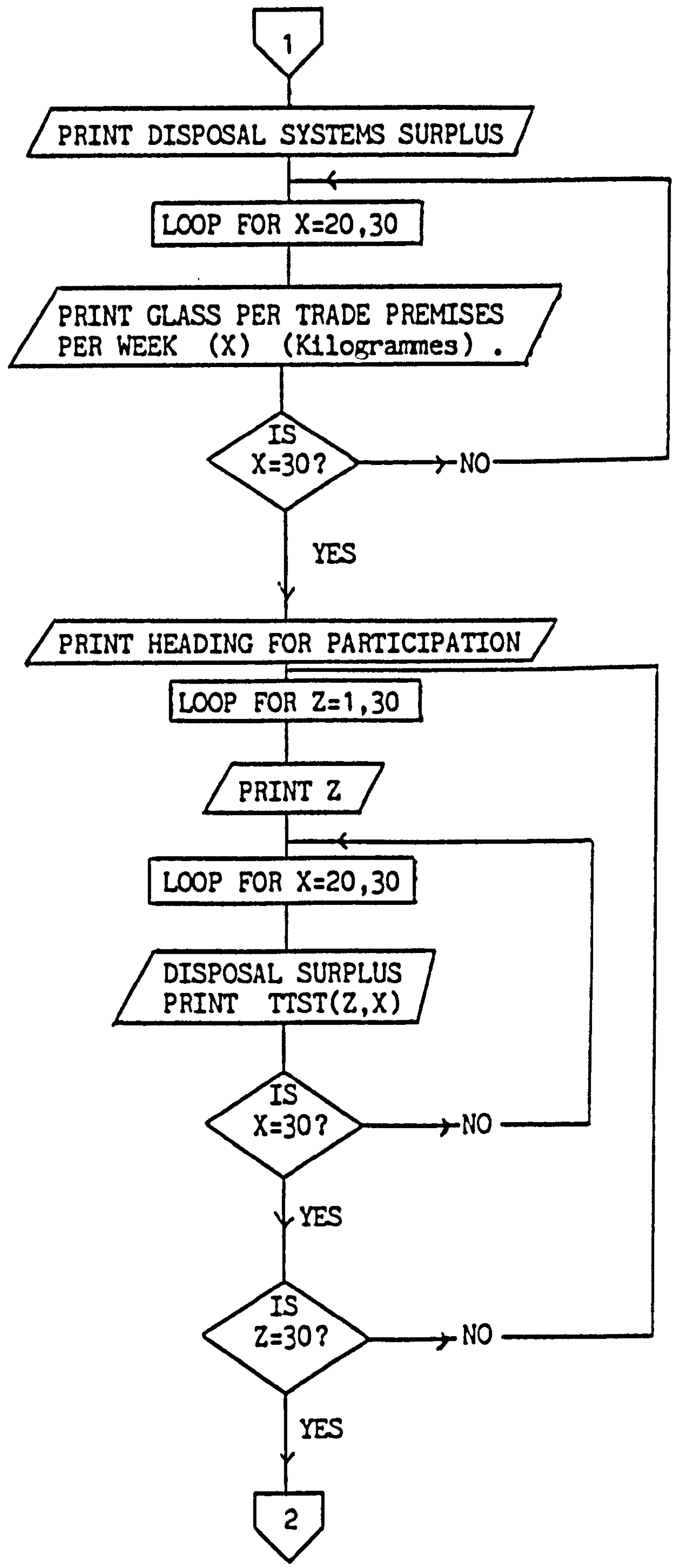
PRINT DISPOSAL SYSTEMS SURPLUS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES PER WEEK (X) (Kilogrammes) .
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,30
PRINT Z
LOOP FOR X=20,30
DISPOSAL SURPLUS PRINT TFST(Z,X)
IS X=30?
NO
YES
IS Z=30?
NO
YES
2


2
PRINT TOTAL SYSTEMS SURPLUS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES PER WEEK (X) (Kilogrammes) .
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,30
PRINT Z
LOOP FOR X=20,30
TOTAL SURPLUS PRINT TFTS(Z,X)
IS X=30?
NO
YES
IS Z=30?
NO
YES
RETURN TO MAIN PROGRAM
END OF SUBROUTINE

SUBROUTINE TRDSHARE

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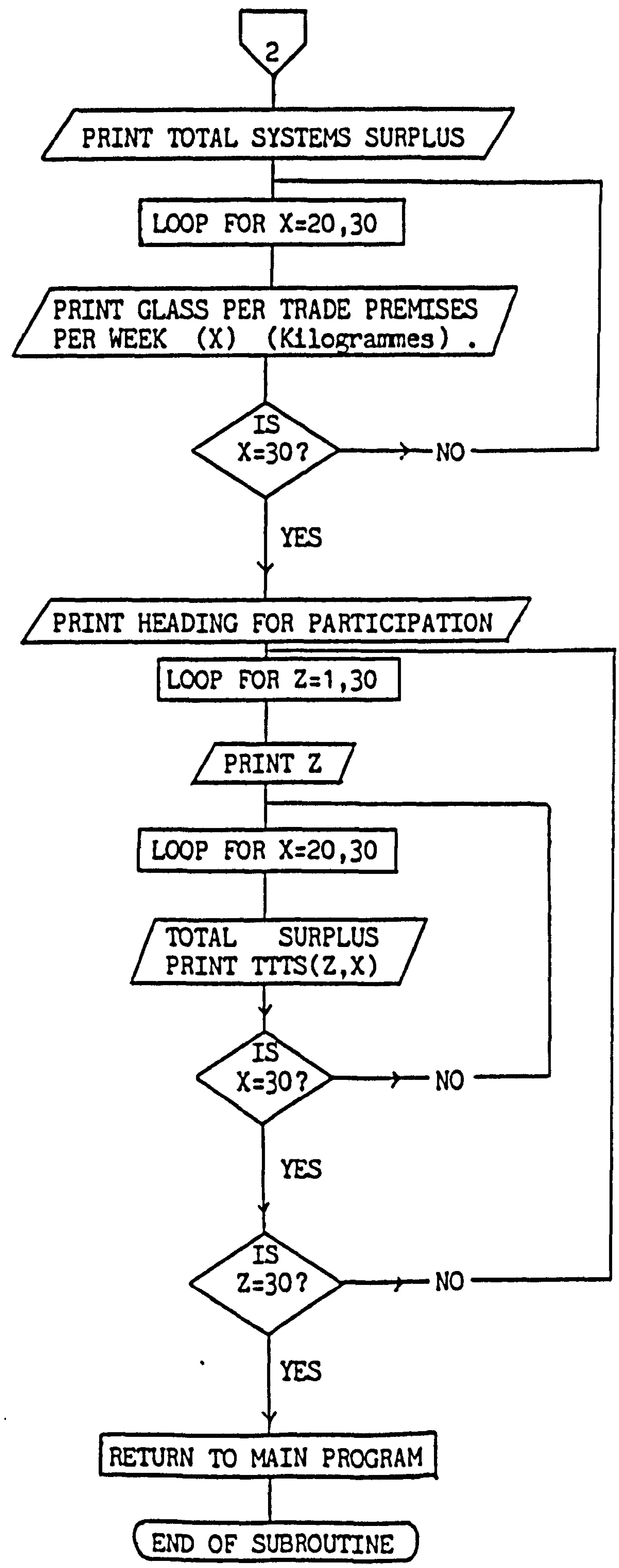
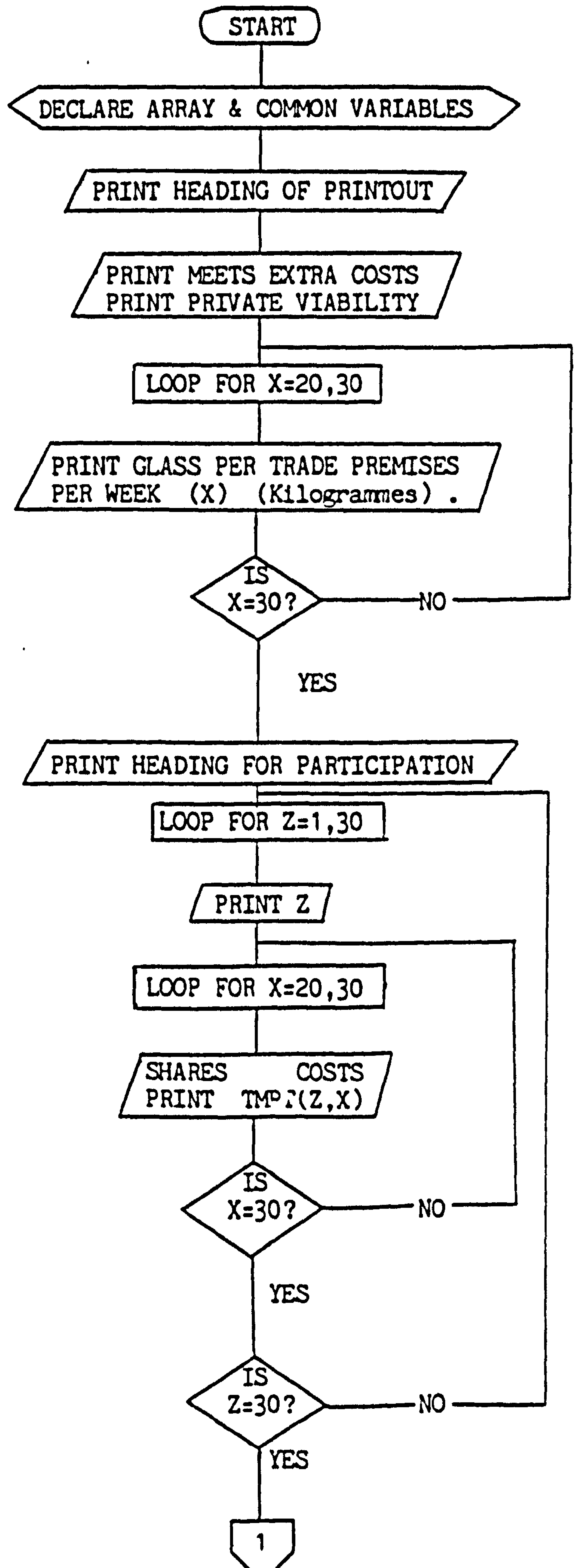
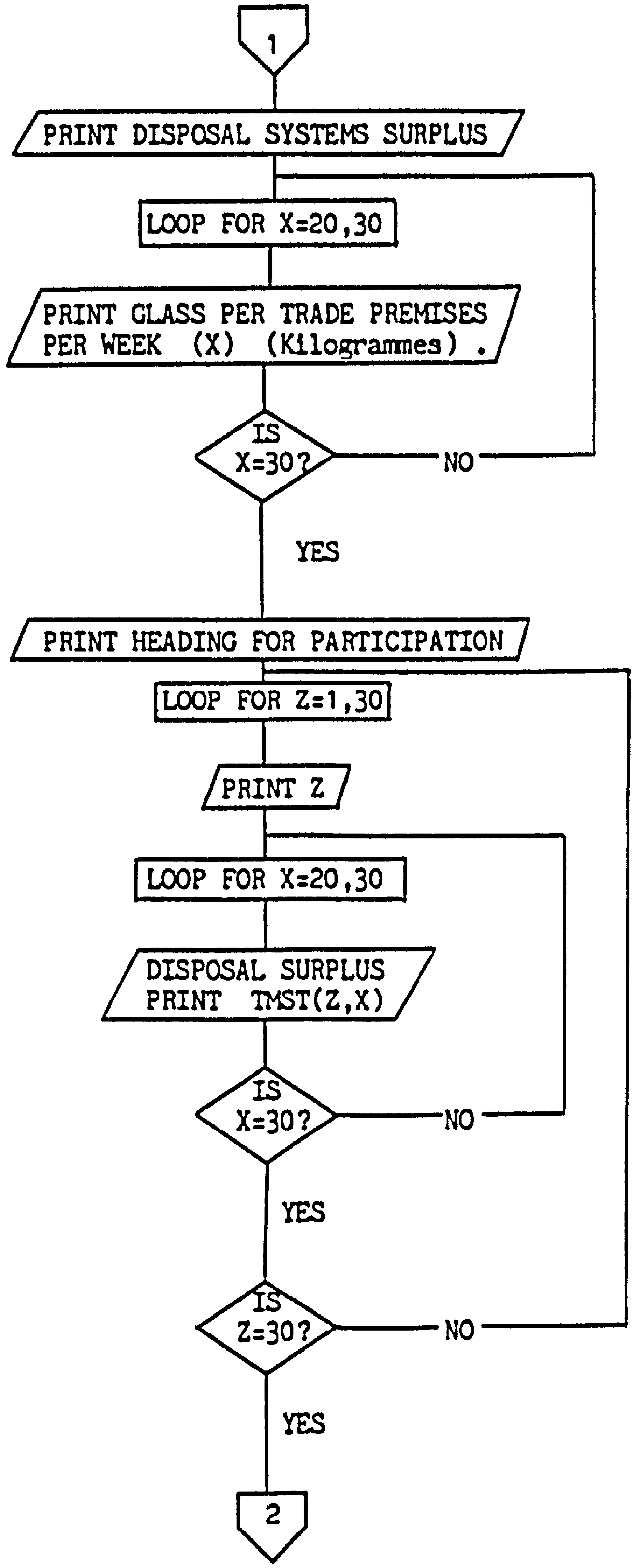
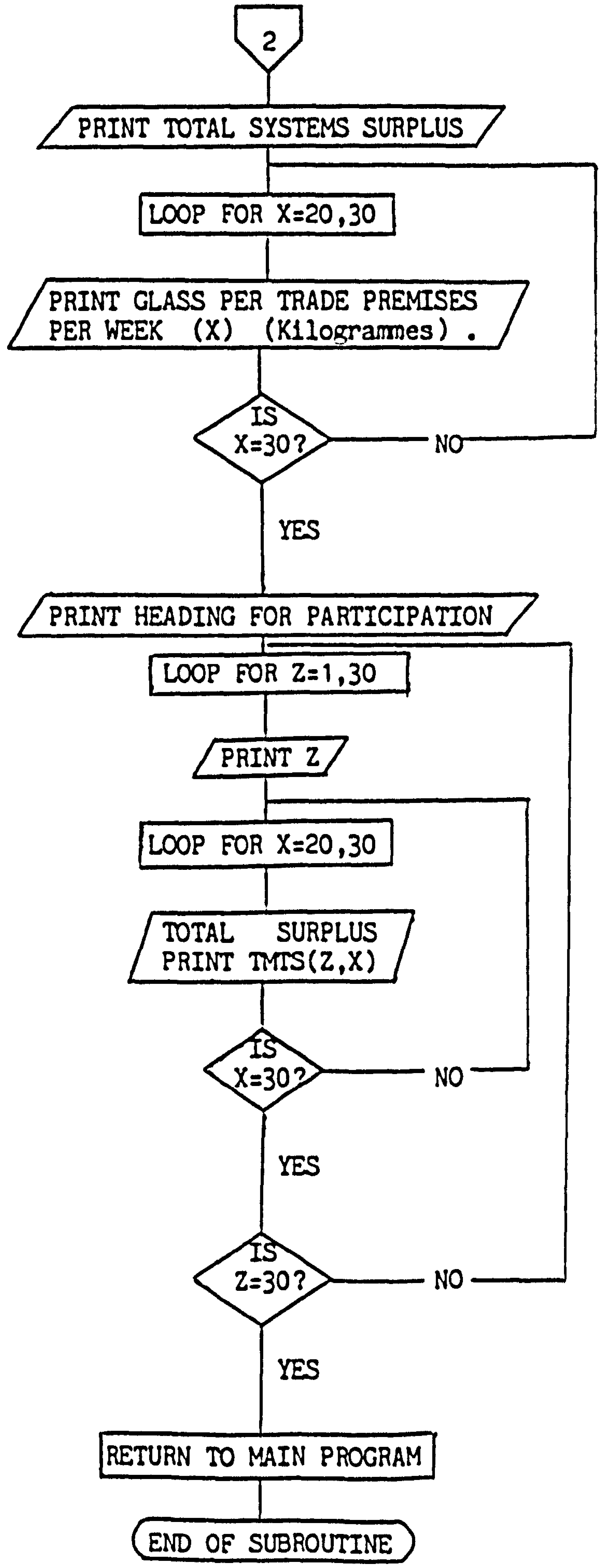
PRINT DISPOSAL SYSTEMS SURPLUS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES PER WEEK (X) (Kilogrammes) .
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,30
PRINT Z
LOOP FOR X=20,30
DISPOSAL SURPLUS PRINT TTST(Z,X)
IS X=30?
NO
YES
IS Z=30?
NO
YES
2


2
PRINT TOTAL SYSTEMS SURPLUS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES PER WEEK (X) (Kilogrammes) .
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,30
PRINT Z
LOOP FOR X=20,30
TOTAL SURPLUS PRINT TTTS(Z,X)
IS X=30?
NO
YES
IS Z=30?
NO
YES
RETURN TO MAIN PROGRAM
END OF SUBROUTINE

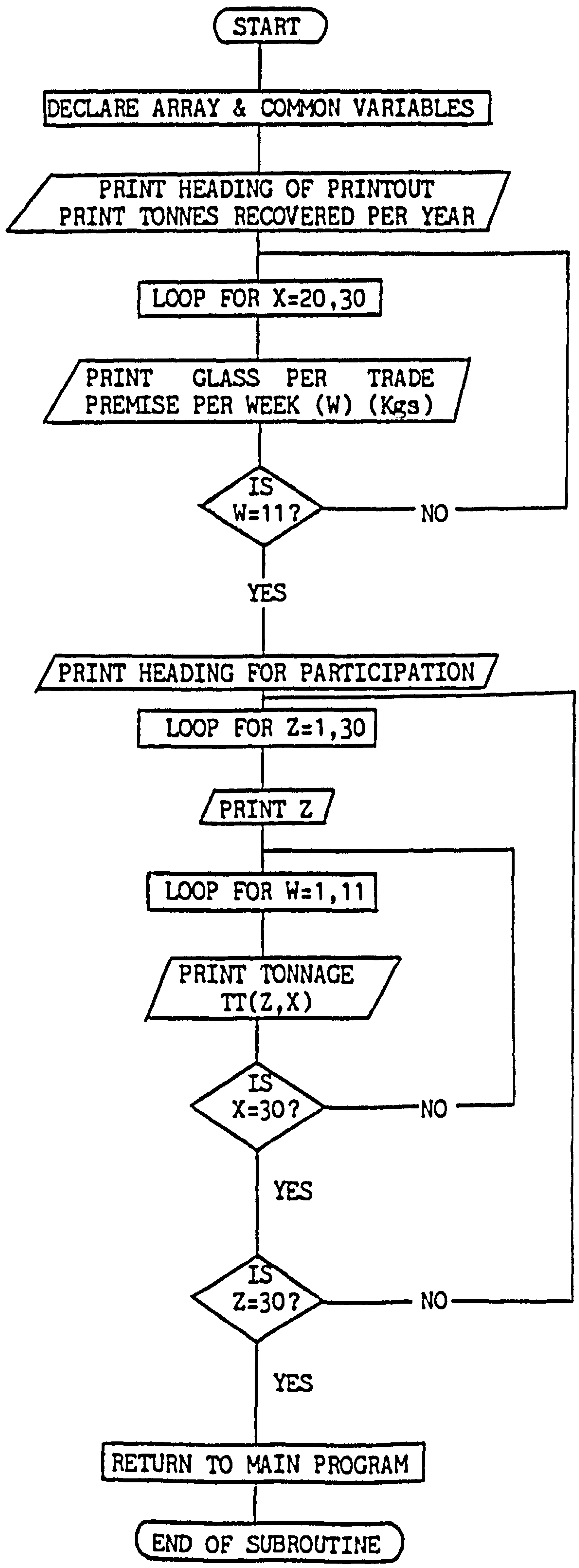
SUBROUTINE TRDEXTRA



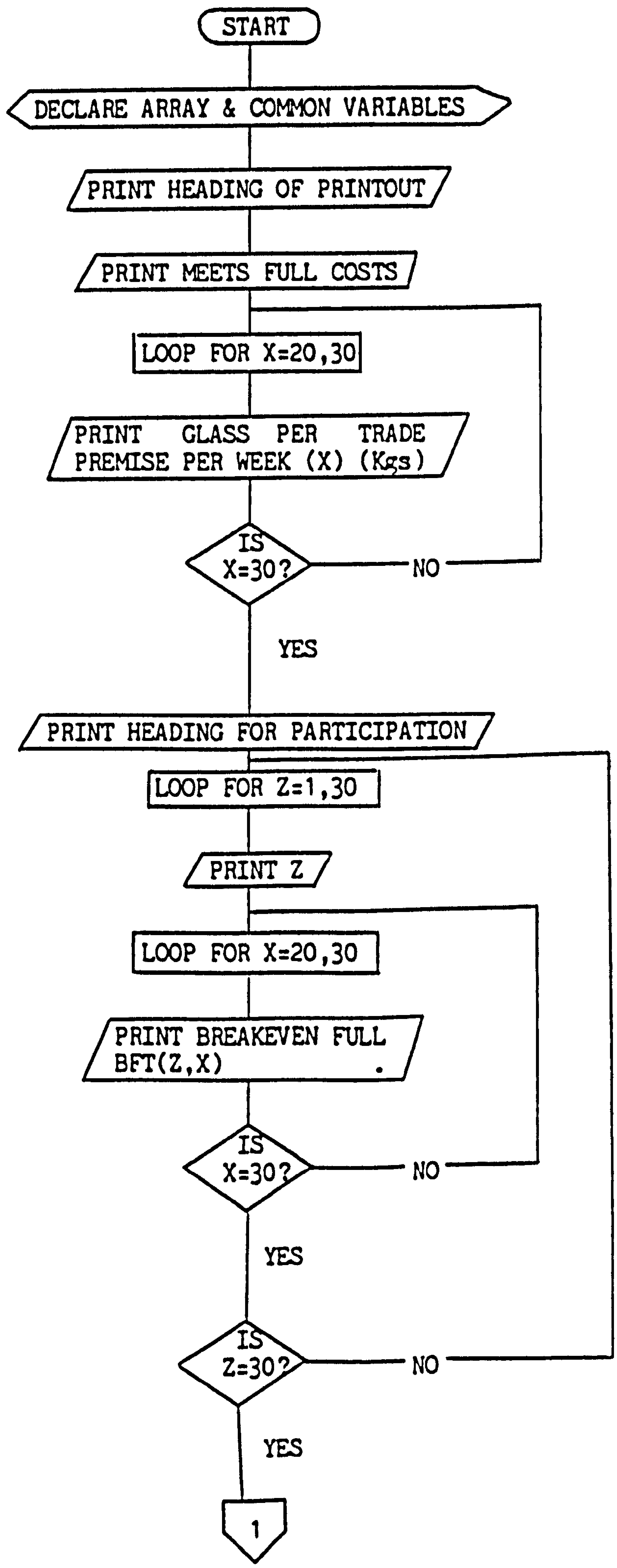

1
PRINT DISPOSAL SYSTEMS SURPLUS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES PER WEEK (X) (Kilogrammes) .
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,30
PRINT Z
LOOP FOR X=20,30
DISPOSAL SURPLUS PRINT TMST(Z,X)
IS X=30?
NO
YES
IS Z=30?
NO
YES
2

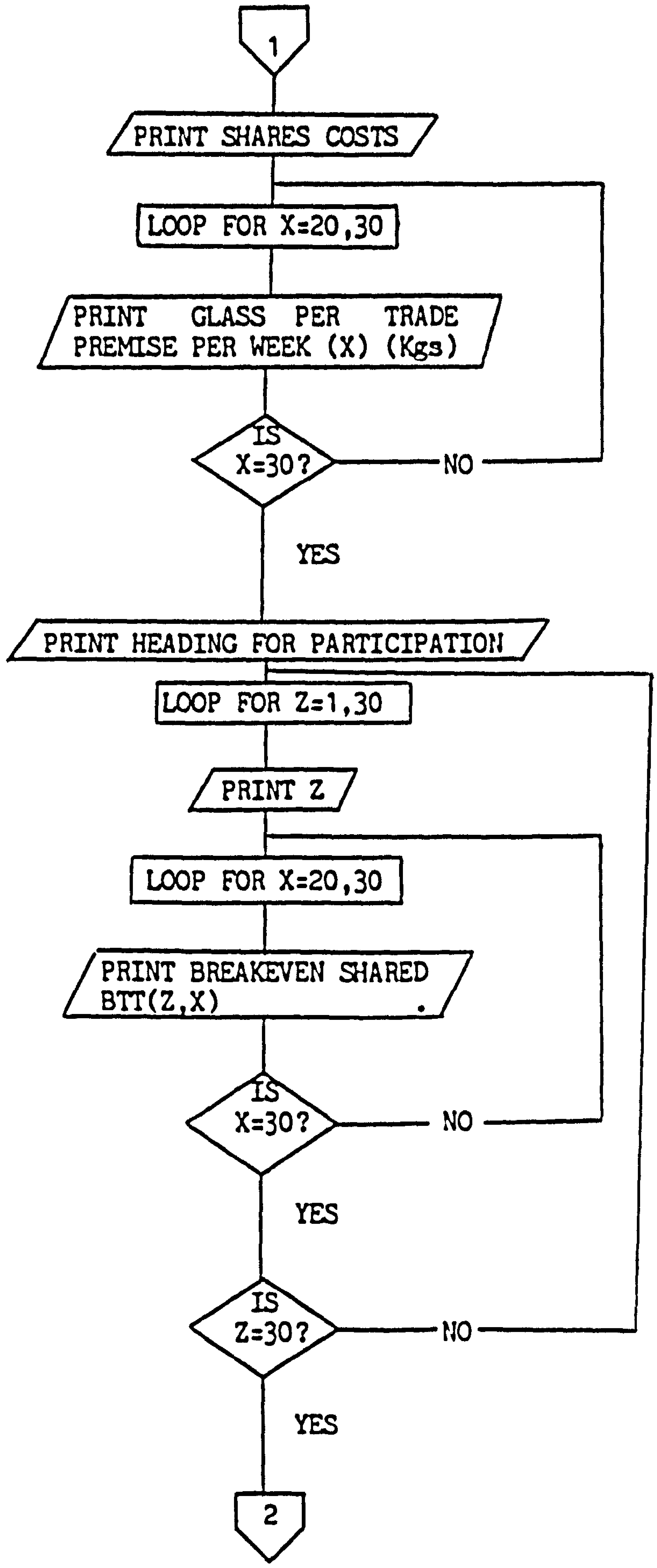

2
PRINT TOTAL SYSTEMS SURPLUS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISES PER WEEK (X) (Kilogrammes) .
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,30
PRINT Z
LOOP FOR X=20,30
TOTAL SURPLUS PRINT TMTS(Z,X)
IS X=30?
NO
YES
IS Z=30?
NO
YES
RETURN TO MAIN PROGRAM
END OF SUBROUTINE

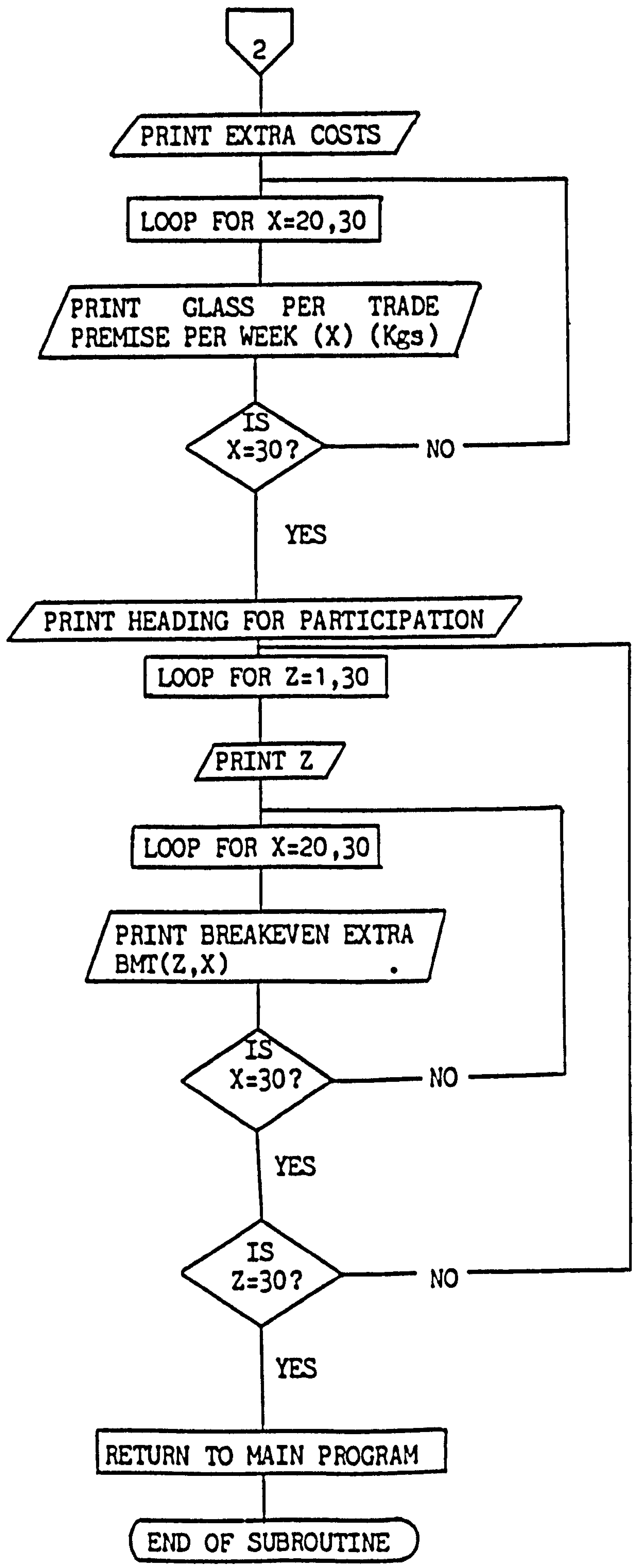
SUBROUTINE TRADAGE



SUBROUTINE TRDBREAK




1
PRINT SHARES COSTS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISE PER WEEK (X) (Kgs)
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,30
PRINT Z
LOOP FOR X=20,30
PRINT BREAKEVEN SHARED BTT(Z,X)
IS X=30?
NO
YES
IS Z=30?
NO
YES
2


2
PRINT EXTRA COSTS
LOOP FOR X=20,30
PRINT GLASS PER TRADE PREMISE PER WEEK (X) (Kgs)
IS X=30?
NO
YES
PRINT HEADING FOR PARTICIPATION
LOOP FOR Z=1,30
PRINT Z
LOOP FOR X=20,30
PRINT BREAKEVEN EXTRA BMT(Z,X)
IS X=30?
NO
YES
IS Z=30?
NO
YES
RETURN TO MAIN PROGRAM
END OF SUBROUTINE

Appendix G

G.8 Data Input For The Trade Glass Viability Model

VARIABLE	I
FORMAT	I1
VALUE	3

From Bottle Bank Run:

VARIABLE	Y	KS	RV	IYS	PWLB	TR	TL
VALUE	1.49	1040	0	10	10	4.0	0.5

VARIABLE	P1	P2	P3	P4	PCG	PGG	PAG	PMG
VALUE	22.0	18.0	18.0	18.0	0.0	0.0	0.0	1.0

For Trade Scheme:

VARIABLE	IC
VALUE	200

VARIABLE	TC	TQ
VALUE	8.0	100

VARIABLE	NV	V	IYV
VALUE	1	35000	7

VARIABLE	U	FU	IYU
VALUE	0	0	7

VARIABLE	DW	NL	LC	AC
VALUE	140	2	140	30

VARIABLE	TM
VALUE	140

VARIABLE	CLC	CNL
VALUE	0	0

VARIABLE	TA
VALUE	0

VARIABLE	TOCP
VALUE	0

VARIABLE	TB	TD
VALUE	5	5

VARIABLE	G
VALUE	1.32

VARIABLE	IYT
VALUE	7

...ER TRADE PREM PER WR (Kg)

...rcentage

...rticipation

20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.
-21879.07	-20836.57	-19888.84	-19023.52	-18230.31	-17500.56	-16826.94	[illegible]	-15624.05	-15084.83	-14581.5
-10932.79	-10411.53	-9937.67	-9505.01	[illegible]	-8743.53	-8406.72	-8094.86	-7805.28	-7535.36	-7284.0
-7284.02	-6936.52	-6620.81	-6332.17	-6067.77	[illegible]	-5599.98	-5392.07	-5199.02	-5019.27	-4851.5
-5459.64	-5199.02	-4963.08	-4745.75	-4547.45	[illegible]	-4196.6	-4040.58	-3895.55	-3751.06	-3635.2
-4365.01	-4156.51	-3966.97	-3793.90	-3635.32	[illegible]	-3354.79	-3229.84	-3114.01	-3006.17	-2905.5
-3635.26	-3461.51	-3303.56	-3159.34	-3027.14	[illegible]	-2793.24	-2689.09	-2592.76	-2502.69	-2419.0
-3114.01	-2965.08	-2829.69	-2706.07	-2592.70	-2488.61	-2392.39	-2303.17	-2220.44	-2143.40	-2071.5
-2723.07	-2592.76	-2474.29	-2366.13	-2266.38	-2175.78	-2091.56	-2013.59	-1941.19	-1873.79	-1810.8
-2419.01	-2303.17	-2197.87	-2101.72	-2013.59	-1932.51	-1857.38	-1788.38	-1724.01	-1664.09	-1608.1
-2175.76	-2071.51	-1976.73	-1890.20	-1810.88	-1737.51	-1670.54	-1608.17	-1550.26	-1496.33	-1446.0
-1976.73	-1881.96	-1795.80	-1717.14	-1645.03	[illegible]	-1517.45	-1460.75	-1408.10	-1359.06	-1313.3
-1810.88	-1724.01	-1645.03	-1572.92	[illegible]	-1445.00	-1388.87	-1337.89	-1289.63	-1244.59	-1202.7
-1670.54	-1590.35	-1517.45	-1450.89	[illegible]	[illegible]	-1281.90	-1233.94	-1189.39	-1147.31	-1109.2
-1550.26	-1475.79	-1408.10	-1346.09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1029.0
-1446.00	-1376.50	-1313.32	-1255.53	[illegible]	[illegible]	[illegible]	[illegible]	-1029.00	-993.06	-959.5
-1354.79	-1289.63	-1230.40	-1176.31	[illegible]	[illegible]	[illegible]	[illegible]	-965.85	-930.15	-898.6
-1274.30	-1212.97	-1157.23	-1106.32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-874.54	-845.0
-1202.75	-1144.84	-1092.19	-1044.11	[illegible]	[illegible]	[illegible]	[illegible]	-855.35	-825.30	-797.3
-1138.74	-1083.87	-1033.99	-988.45	[illegible]	[illegible]	[illegible]	[illegible]	-808.53	[illegible]	-754.6
-1081.13	-1029.00	-981.60	-938.35	[illegible]	[illegible]	[illegible]	[illegible]	-768.38	[illegible]	-716.0
-1029.00	-979.36	-934.23	-893.02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-705.47	-681.5
-981.62	-934.23	-891.15	-851.92	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-649.9

ARES OPERATING COSTS
LASS PER TRADE PREMISES PER WEEK (Rs)

ercentage articipation	20.0	21.0	22.0	23.0	24.0	[illegible]	26.0	27.0	28.0	29.0	30.
1.	-4717.47	-4492.19	-4287.38	-4100.79	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-3140.
2.	-2351.99	-2239.34	-2135.94	-2043.44	-1957.74	[illegible]	-1804.10	-1735.71	[illegible]	[illegible]	-1563.
3.	-1563.49	-1488.40	-1420.13	-1357.80	-1300.85	[illegible]	-1195.57	[illegible]	[illegible]	-1074.05	-1037,
4.	-1169.24	-1112.92	-1061.72	-1014.97	[illegible]	[illegible]	[illegible]	[illegible]	-831.32	-801.18	-775.
5.	-932.69	-887.64	-846.58	-809.28	[illegible]	[illegible]	[illegible]	[illegible]	-652.35	[illegible]	-617.
6.	-775.00	-737.45	-703.31	-672.15	-640.88	[illegible]	[illegible]	[illegible]	-549.71	[illegible]	-512.
7.	-662.35	-630.17	-600.91	-574.20	-543.71	[illegible]	[illegible]	[illegible]	-469.25	[illegible]	-437.
8.	-577.87	-549.71	-524.11	-500.74	-479.31	-459.80	-441.40	-424.55	[illegible]	-394.34	-380.
9.	-512.16	-487.13	-464.38	-443.60	-424.55	-407.03	[illegible]	-375.88	-361.97	-349.03	-336.
0.	-459.60	-437.07	-416.59	-397.89	-380.75	-364.98	-350.42	-336.94	-324.43	-312.77	-301.
1.	-416.59	-396.11	-377.49	-360.49	-344.91	-330.57	-317.34	[illegible]	-293.71	[illegible]	-273.
2.	-380.75	-361.97	-344.91	-329.32	-315.04	[illegible]	-289.77	[illegible]	[illegible]	[illegible]	-249.
3.	-350.42	-333.09	-317.34	-302.95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-229.
4.	-324.43	-308.33	-293.71	-280.35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-211.
5.	-301.90	-286.98	-273.23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-196.
6.	-282.19	-268.11	-255.31	-243.62	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-190.42	-183.
7.	-264.79	-251.54	-239.49	-228.45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-172.
8.	-249.33	-236.82	-225.44	-215.05	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-161.
9.	-235.50	-223.64	-212.86	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-152.
0.	-223.05	-211.78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-144.
1.	-211.78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TRADE SYSTEM MEETS EXTRA COSTS
GLASS PER TRADE PREMISES PER WEEK (Kg)

Percentage Of Participation	20.0	21.0	22.0	23.0	[illegible]	25.0	26.0	27.0	28.0	29.0	
1.	-375.07	-356.57	-339.75	-324.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-254.05	-254.48	-24
2.	-180.79	-171.53	-163.12	[illegible]	[illegible]	[illegible]	[illegible]	-130.4[illegible]	-125.28	-120.49	-11
3.	-116.02	-109.86	-104.25	-99.[illegible]	[illegible]	[illegible]	-86.13	-82.44	-79.02	-75.83	-7
4.	-83.64	-79.02	-74.81	-70.87	[illegible]	[illegible]	[illegible]	-58.48	-55.89	-53.50	-5
5.	-64.21	-60.51	-57.15	-54.05	[illegible]	[illegible]	[illegible]	[illegible]	-42.01	-40.10	-3
6.	-51.26	-48.18	-45.37	-42.81	-40.27	[illegible]	[illegible]	[illegible]	-32.76	-31.16	-2
7.	-42.01	-39.37	-36.96	-34.77	[illegible]	-30.91	-29.[illegible]	-27.62	-26.15	-24.78	-2
8.	-35.07	-32.75	-30.66	-28.74	-26.[illegible]	-25.35	-23.65	-22.48	-21.19	-20.00	-1
9.	-29.67	-27.62	-25.75	-24.04	-22.48	-21.04	-19.71	-18.48	-17.34	-16.28	-1
10.	-25.36	-23.51	-21.82	-20.29	-18.88	-17.59	-16.39	-15.28	-14.26	-13.30	-1
11.	-21.82	-20.14	-18.61	-17.22	-15.94	-14.76	-13.67	-12.67	-11.73	-10.86	-1
12.	-18.88	-17.34	-15.94	-14.66	-13.48	-12.40	-11.4[illegible]	-10.49	-9.53	-8.83	-
13.	-16.39	-14.97	-13.67	-12.49	-11.4[illegible]	-10.41	-9.49	-8.64	-7.85	-7.11	-
14.	-14.26	-12.93	-11.73	-10.63	-9.63	-8.70	-7.85	-7.0[illegible]	-6.33	-5.64	-
15.	-12.40	-11.17	-10.05	-9.03	[illegible]	-7.22	-6.42	-5.6[illegible]	-5.00	-4.37	-
16.	-10.79	-9.63	-8.58	-7.62	-6.74	-5.93	-5.16	-4.49	-3.85	-3.25	-
17.	-9.36	-8.27	-7.28	-6.38	-5.55	-4.79	-4.08	-3.43	-2.83	-2.26	-
18.	-8.09	-7.06	-6.12	-5.27	-4.48	-3.77	-3.11	-2.49	-1.92	-1.39	-
19.	-6.95	-5.98	-5.09	-4.2[illegible]	[illegible]	[illegible]	[illegible]	-1.85	-1.[illegible]	-0.60	-
20.	-5.93	-5.00	-4.15	-3.30	[illegible]	[illegible]	[illegible]	-0.87	-0.38	0.10	
21.	-5.00	-4.12	-3.32	-2.55	-1.[illegible]	-1.30	-0.73	-0.21	0.28	0.74	

GLASS PER TRADE DIVIDED PER WEEK (KG)

PERCENTAGE OF PARTICIPATION	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.0
1.0	2.00	2.10	2.20	2.30	[illegible]	2.50	2.60	2.70	2.80	2.90	3.0
2.0	4.00	4.20	4.40	4.60	[illegible]	5.00	5.20	5.40	5.60	5.80	6.0
3.0	6.00	6.30	6.60	[illegible]	[illegible]	7.50	7.80	8.10	8.40	8.70	9.0
4.0	8.00	8.40	8.80	[illegible]	9.60	10.00	10.40	10.80	11.20	11.60	12.0
5.0	10.00	10.50	11.00	11.50	12.00	12.50	13.00	13.50	14.00	14.50	15.0
6.0	12.00	12.60	13.20	13.80	14.40	15.00	15.60	16.20	16.80	17.40	18.0
7.0	14.00	14.70	15.40	[illegible]	16.80	17.50	18.20	18.90	19.60	20.30	21.0
8.0	16.00	16.80	17.60	18.40	19.20	20.00	20.80	21.60	22.40	23.20	24.0
9.0	18.00	18.90	19.80	20.70	21.60	22.50	23.40	24.30	25.20	26.10	27.0
10.0	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.0
11.0	22.00	[illegible]	24.20	25.30	[illegible]	27.50	28.60	29.70	30.80	31.90	33.0
12.0	24.00	25.20	[illegible]	[illegible]	[illegible]	30.00	31.20	32.40	33.60	34.80	36.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32.50	33.80	35.10	36.40	37.70	39.0
14.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	35.00	36.40	37.80	39.20	40.60	42.0
15.0	[illegible]	[illegible]	[illegible]	[illegible]	36.00	37.50	39.00	40.50	42.00	43.50	45.0
16.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40.00	41.60	43.20	44.80	46.40	48.0
17.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	42.50	44.20	45.90	47.60	49.30	51.0
18.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	45.00	46.80	48.60	50.40	52.20	54.0
19.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	47.50	49.40	51.30	53.20	55.10	57.0
20.0	40.00	42.00	44.00	[illegible]	48.00	50.00	52.00	54.00	56.00	58.00	60.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	54.60	56.70	58.80	60.90	63.0

BREAKEVEN PRICES FOR TRADE SCHEMES

Trade Scheme Meets Full Costs

Glass Per Trade Premises Per Week (Kg)

Percentage of Participation	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.
1.	21837.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16844.94	16221.22	15642.05	15102.83	14599.
2.	10950.79	[illegible]	9956.67	9520.01	[illegible]	[illegible]	8424.72	8112.86	7823.28	7553.66	7302.
3.	7302.02	[illegible]	6638.51	[illegible]	[illegible]	[illegible]	5517.98	5410.07	5217.02	5037.28	4869.
4.	5477.64	5217.02	4980.08	4763.75	[illegible]	4383.01	4214.61	4058.68	3913.89	3779.08	3653.
5.	4383.01	[illegible]	3984.97	[illegible]	[illegible]	3507.31	3372.59	3247.84	3132.01	3024.17	2923.
6.	3653.25	3479.51	[illegible]	3177.34	[illegible]	2923.51	2811.24	2707.29	2610.76	2520.89	2437.
7.	3132.01	[illegible]	[illegible]	2724.07	[illegible]	2506.51	2410.28	2321.17	2238.44	2161.40	2089.
8.	2741.07	2610.75	[illegible]	[illegible]	[illegible]	[illegible]	2109.55	2031.59	1959.19	1891.79	1828.
9.	2437.01	2321.17	[illegible]	[illegible]	[illegible]	[illegible]	1875.65	1806.36	1742.01	1682.09	1626.
10.	2193.76	2089.51	[illegible]	[illegible]	[illegible]	[illegible]	1688.54	1626.17	1568.26	1514.33	1464.
11.	1994.73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1535.45	1478.75	1426.10	1377.08	1331.
12.	1828.88	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1407.87	1355.89	1307.63	1262.69	1220.
13.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1299.92	1251.94	1207.39	1165.91	1127.
14.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1207.39	1162.84	1121.47	1082.95	1047.
15.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1127.20	1085.51	1047.00	1011.06	977.
16.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1057.03	1018.05	981.85	948.15	916.
17.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	995.11	958.42	924.36	892.64	863.
18.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	940.08	905.43	873.25	843.30	815.
19.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	890.54	858.01	827.53	799.15	772.
20.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	846.52	815.34	786.38	759.42	734.
21.	1047.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	805.43	775.72	749.15	723.47	699.
22.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	769.97	741.62	715.30	690.79	667.
23.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	735.55	709.57	684.39	660.95	639.
24.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	706.18	680.20	656.06	633.60	612.
25.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	630.00	608.43	588.
26.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	605.94	585.20	565.
27.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	583.67	563.70	545.
28.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	605.94	583.87	562.98	543.73	525.
29.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	563.70	543.73	525.13	507.
30.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	545.06	525.75	507.78	491.

ade Scheme Shares Costs [illegible]

Glass Per Trade Premises Per [illegible] (Kg)

rcentage rticipation	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.0
1.	4735.47	4510.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3643.71	3508.92	3383.77	3267.24	3158.4
2.	[illegible]	2257.34	[illegible]	[illegible]	[illegible]	[illegible]	1824.10	1756.71	1694.13	1635.87	1581.4
3.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1217.57	1172.64	1130.92	1092.[illegible]	1055.8
4.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	880.61	849.32	820.18	793.0
5.	950.65	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	732.34	705.38	680.35	657.05	636.3
6.	[illegible]	755.45	[illegible]	[illegible]	[illegible]	[illegible]	611.03	588.57	567.71	548.29	530.1
7.	[illegible]	549.17	[illegible]	[illegible]	[illegible]	[illegible]	524.39	505.13	487.25	470.[illegible]	455.0
8.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	455.40	442.55	426.91	412.34	398.7
9.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	409.58	[illegible]	379.57	367.03	354.9
0.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	368.42	354.34	342.43	330.77	319.9
1.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	335.34	323.08	311.71	301.11	291.2
2.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	307.77	296.54	286.11	276.39	267.3
3.	[illegible]	351.09	[illegible]	[illegible]	[illegible]	[illegible]	284.44	274.07	264.44	255.48	247.1
4.	[illegible]	326.33	[illegible]	[illegible]	[illegible]	[illegible]	264.44	254.82	245.88	237.55	229.7
5.	319.90	304.89	291.23	[illegible]	[illegible]	[illegible]	247.11	238.13	229.78	222.02	214.7
6.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	231.95	223.53	215.70	208.42	201.8
7.	[illegible]	269.34	[illegible]	[illegible]	[illegible]	[illegible]	218.57	210.64	203.28	196.43	190.0
8.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	205.68	199.19	192.24	185.76	179.7
9.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	203.70	196.04	188.94	182.36	176.22	170.5
0.	[illegible]	229.78	[illegible]	[illegible]	[illegible]	193.74	186.46	179.72	173.46	167.64	162.2
1.	229.78	219.06	[illegible]	200.40	[illegible]	184.73	177.80	171.38	165.42	159.87	154.6
2.	219.54	209.30	199.99	191.49	183.70	176.54	169.92	163.79	158.10	152.81	147.8
3.	210.19	200.40	191.49	183.36	175.91	169.06	162.73	156.87	151.42	146.36	141.63
4.	201.62	192.24	183.70	175.91	168.77	162.20	156.13	150.52	145.30	140.45	135.92
5.	193.74	184.73	176.54	169.06	162.20	155.89	150.07	144.68	139.67	135.01	130.66
6.	186.46	177.80	169.92	162.73	156.13	150.07	144.47	139.29	134.47	129.99	125.81
7.	179.72	171.38	163.79	156.87	150.52	144.68	139.29	134.29	129.66	125.34	121.31
8.	173.45	165.42	158.10	151.42	145.30	139.67	134.47	129.66	125.19	121.03	117.14
9.	167.64	159.87	152.81	146.36	140.45	135.01	129.99	125.34	121.03	117.01	113.26
0.	162.20	[illegible]	147.85	141.63	135.92	130.66	125.81	121.31	117.14	113.26	109.63

rade Scheme Meets Extra Costs Incurred

Glass Per Trade Premises Per Week

ercentage f articipation	20.00	21.00	22.00	23.00	24.00	25.00	26.00	27.00	28.00	29.00	30.
1.	393.07	374.57	357.75	342.39	328.[illegible]	315.36	303.40	292.33	282.05	272.48	263.[illegible]
2.	198.79	189.53	181.12	173.44	166.40	159.93	153.95	148.42	143.28	138.49	134.[illegible]
3.	134.02	127.86	122.25	117.13	112.44	108.12	104.13	100.44	97.02	93.83	90.[illegible]
4.	101.64	97.02	92.81	88.97	85.45	82.21	79.23	76.46	73.89	71.50	69.[illegible]
5.	82.21	78.51	75.15	72.08	69.26	66.67	64.28	62.07	60.01	58.10	56.[illegible]
6.	69.25	66.18	63.37	60.81	58.47	56.31	54.32	52.47	50.76	49.16	47.[illegible]
7.	60.01	57.37	54.95	52.77	50.78	48.91	47.20	45.62	44.15	42.78	41.[illegible]
8.	53.07	50.76	48.66	46.74	44.95	43.36	41.86	40.48	39.19	38.00	36.[illegible]
9.	47.57	45.62	43.75	42.04	40.48	39.04	37.71	36.48	35.34	34.28	33.[illegible]
10.	43.36	41.51	39.82	38.29	36.88	35.59	34.39	33.28	32.26	31.30	30.[illegible]
11.	39.82	38.[illegible]	[illegible]	35.22	[illegible]	32.76	31.67	30.67	29.73	28.86	28.[illegible]
12.	36.86	35.34	33.94	32.65	[illegible]	30.40	29.41	28.49	27.63	26.63	26.[illegible]
13.	[illegible]	32.97	31.57	30.49	[illegible]	28.41	27.49	26.64	25.85	25.11	24.[illegible]
14.	32.25	30.93	29.73	[illegible]	27.53	[illegible]	25.85	25.06	24.33	23.64	23.[illegible]
15.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24.43	23.69	23.00	22.37	21.[illegible]
16.	28.79	27.63	[illegible]	[illegible]	[illegible]	23.93	23.18	22.49	21.85	21.25	20.[illegible]
17.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22.08	21.43	20.83	20.26	19.[illegible]
18.	25.09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21.11	20.49	19.92	19.39	18.[illegible]
19.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20.23	19.65	19.11	18.60	18.[illegible]
20.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20.04	19.45	18.89	18.38	17.90	17.[illegible]
21.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18.73	18.21	17.72	17.26	16.[illegible]
22.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18.09	17.58	17.12	16.68	16.[illegible]
23.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17.50	17.01	16.57	16.15	15.[illegible]
24.	20.65	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16.95	16.49	16.06	15.67	15.[illegible]
25.	20.04	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16.45	16.01	15.60	15.22	14.[illegible]
26.	19.45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16.00	15.57	15.18	14.81	14.[illegible]
27.	18.89	[illegible]	[illegible]	[illegible]	[illegible]	16.01	15.57	15.16	14.78	14.43	14.[illegible]
28.	18.38	[illegible]	[illegible]	[illegible]	[illegible]	15.60	15.18	14.78	14.41	14.07	13.[illegible]
29.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14.81	14.43	14.07	13.74	13.[illegible]
30.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14.45	14.09	13.75	13.43	13.[illegible]

Appendix G

TABLE G.10 Summary Of Trade Collection System

A. SET UP COSTS (TSUC)

1. Skip Costs (TSK)

a. New Skip Costs (TSK)
No Of Skips (TQ): TQ = IC * 2 ....
Cost Of Individual Skips (TC) ....
Expected Life Of Skips (IYT) ....
Interest Rate (PWLB) ....

$$TSK = \left(\frac{TC * TQ}{IYT}\right) * \left(1 + \left(\frac{PWLB * IYT}{100}\right)\right)$$
$$= \left(\frac{\quad * \quad}{\quad}\right) * \left(1 + \left(\frac{\quad * \quad}{100}\right)\right) \ldots\ldots\ldots\ldots\ldots\ldots$$

2. Storage Costs (TKS)

a. New Storage Sites
Cost Of Construction (KS) ....
Expected Life Of Site (IYS) ....
Interest Rate (PWLB) ....
Land Rateable Value (RV) ....

$$KS = \left(\frac{KS}{IYS}\right) * \left(1 + \left(\frac{PWLB * IYS}{100}\right)\right)$$
$$= \left(\frac{\quad}{\quad}\right) * \left(1 + \left(\frac{\quad * \quad}{100}\right)\right)$$

STC = KS + RV

Meets Full Storage Costs (TSTF)
TSTF = STC ....

Shares Existing Storage Costs (TSTC)
TSTC = 0.6 * STC ....

Meets Extra (Marginal) Costs (KTS)
KTS = 0 ....

3. Initial Promotion Costs (IPC) ....

4. Crusher Costs
Capital Cost Of Machine (U) ....
Cost Of New Building (FU) ....
Expected Life Of Machine (IYU) ....
Interest Rate (PWLB) ....

$$CUC = \left(\frac{U + FU}{IYU}\right) * \left(1 + \left(\frac{PWLB * IYU}{100}\right)\right)$$
$$= \left(\frac{\quad + \quad}{\quad}\right) * \left(1 + \left(\frac{\quad * \quad}{100}\right)\right) \ldots\ldots\ldots\ldots\ldots\ldots$$

Meets Full Crusher Costs (TCUF)
TCUF = CUC ....

Shares Crusher Costs (TCUC)
TCUC = 0.6 * CUC ....

Meets Extra (Marginal) Costs (CTC)
CTC = 0 ....

5. Collection Vehicle Charges

Number Of Vehicles (NV) ....
Cost Of Vehicle (V) ....
Expected Vehicle Life (IYV) ....
Interest Rate (PWLB) ....

$$VI = \left(\frac{NV * V}{IYV}\right) * \left(1 + \left(\frac{PWLB * IYV}{100}\right)\right)$$

$$= \left(\frac{\quad * \quad}{\quad}\right) * \left(1 + \left(\frac{\quad * \quad}{100}\right)\right) \text{.........................}$$

Meets Full Vehicle Costs (TVIF)
TVIF = VI ....

Shares Vehicle Costs (TVI) ....
TVI = 0.2 * VI ....

Makes Use Of Existing Vehicles (TVIM)
TVIM = 0 ....

6. SUMMARY OF TRADE SET UP COSTS

	Full Costs:		Shares Costs:		Extra Costs:	
Skip Costs:	TSK	....	TSK	....	TSK	....
Storage Costs	TSTF	....	TSTC	....	TKS	....
Promotion Costs	IPC	....	IPC	....	IPC	....
Crusher Costs	TCUF	....	TCUC	....	CTC	....
Vehicle Costs	TVIF	....	TVI	....	TVIM	....
TOTAL	TFSUC	....	TTSUC	....	TMSUC	....

TABLE G.10 (Cont) SUMMARY OF TRADE COLLECTION COSTS

B. OPERATING COSTS

1. Labour Costs

LAB = 50 * (DW + NL * LC) * (1 + 0.01 * AC)
= 50 * (+ *) * (1 + 0.01 *)..................

Drivers Wage (DW) ....
Number Of Loaders (NL) ....
Loaders Wage (LC) ....
Add On Costs (AC) ....

a. Meets Full Labour Costs (TLAB)
TLAB = LAB ....

b. Shares Labour Costs (TTLB)
TTLB = 0.2 * TLAB ....

c. Meet Extra Labour Costs (TMLB)
TMLB = 0 ....

2. Vehicle Operating Costs

a. Meets Full Costs (TV)
TV =(NV * 50 * TM)
=(* 50 *) ....

Number Of Vehicles (NV) ....
Number Of Weeks (50) ....
Transport Costs Per Week ....
Days Worked Per Week (G) ....

b. Share Vehicle Costs (TTV)
TTV =(G * TV)..

c. Meet Additional Costs (TMTV)
TMTV = 0 ....

3. Skip Maintenance (TSKM)
TSKM =(TQ * SKM)...

4. Administration (TA)
TA =(TH + TW)..

5. On-Going Promotion (TPUB)
TPUB =(PB * IC)..

6. Crusher Operating Costs (CCC)
COC = 50 * (CLC + CNL) * (1 + 0.01 * AC)
= 50 * (+) * (1 + 0.01 *) ....

Cost Of Crusher Labour (CLC) ....
Cost Of Conveyor Labour (CNL) ....
Add On Costs (AC) ....

a. Meets Full Crusher Costs (CLAB)
CLAB = COC ....

b. Shares Crusher Costs (TCLB)
TCLB = 0.2 * CLAB ....

c. Meets Extra Crusher Costs (TCMB)
TCMB = 0 ....

7. Crusher Supplies & Services (CSS)

CSS = CSPT * (0.01 * X * (0.05 * Z * IC))
= * (0.01 * * (0.05 * *)) ....

Cost Of Supplies Per Tonne (CSPT) ....

a. Meets Full Costs (CSC)
CSC = CSS ....

b. Shares Costs Of Supplies (TCSC)
TCSC = 0.2 * CSS ....

c. Meets Extra Costs Of Supplies (TCMC)
TCMC = 0 ....

8. Storage Maintenance (TSTM) ....

9. Bulk Transport (TBTR)
TBTR = (TR + TL) * TRT ....

10. Summary Of Total Trade Operating Costs

	Full Costs	Share Costs	Extra Costs
Labour Costs	TLAB	TTLB	TMLB ....
Vehicle Costs	TV	TTV	TMTV ....
Skip Maintenance	TSKM	TSKM	TSKM ....
Administration	TA	TA	TA ....
Promotion Costs	TPUB	TPUB	TPUB ....
Crusher Costs	CLAB	TCLB	TCMB ....
Crusher Supplies	CSC	TCSC	TCMC ....
Storage Maintenance	TSTM	TSTM	TSTM ....
Bulk Transport	TBTR	TBTR	TBTR ....
TOTAL	TFOPC	TTOPC	TMOPC ....

TABLE G.10 (Continued) Summary Of Trade Operation

C. INCOME

1. Revenue (TTRA)

a.	Clear Glass: P1 * PCG * TRT	....
b.	Green Glass: P2 * PGG * TRT	....
c.	Amber Glass: P3 * PAG * TRT	....
d.	Mixed Glass: P4 * PMG * TRT	....
	TOTAL (TTRA)	....

2. Disposal Cost Savings (SRD)

a.	Average Landfill Costs	per tonne
b.	Incineration Costs	per tonne

Average Disposal Cost (Y)	per tonne
SRD = Y * TRT	

3. Changes In Trade Collection Costs

a. Average Collection Costs (TB) .... per tonne
Quantity of Waste Diverted (TRT) .... tonnes

Savings In collection Costs (SCT)
SCT = TB * TRT ....

b. Average Charge For Collection (TD) .... per tonne
Quantity of charged waste diverted (Q)........... tonnes

Loss In Trade Revenue (LTR)
LTR = TD * Q ....

c. Net Change In Trade Collection Costs (TCH)
TCH = LTR - SCT

4. Summary Of Income

Income = Revenue (TTRA)..................................
+ Disposal Cost Savings (SRD) ....
+ Change In Collection Costs (TCH) ....
= TOTAL ....

D. NET COSTS

1. Meets Full Costs
   a. Operating Surplus (TFPT)

      Revenue (TTRA) ....
      - Trade Set Up Costs (TFSUC) ....
      - Trade Operating Costs (TFOPC) ....
      = Operating Surplus (TFPT) ....

   b. Disposal Systems Surplus (TFST)

      Revenue (TTRA) ....
      + Disposal Cost Savings (TRDS) ....
      - Trade Set Up Costs (TFSUC) ....
      - Trade Operating Costs (TFOPC) ....
      = Disposal Systems Surplus (TFST) ....

   c. Total Systems Surplus (TFTS)

      Revenue (TTRA) ....
      + Disposal Cost Savings (TRDS) ....
      + Changes In Collection Costs (TCH) ....
      - Trade Set Up Costs (TFSUC) ....
      - Trade Operating Costs (TFOPC) ....
      = Total Systems Surplus (TFTS) ....

2. Shares Costs
   a. Operating Surplus (TTPT)

      Revenue (TTRA) ....
      - Trade Set Up Costs (TFSUC) ....
      - Trade Operating Costs (TFOPC) ....
      = Operating Surplus (TTPT) ....

   b. Disposal Systems Surplus (TTST)

      Revenue (TTRA) ....
      + Disposal Cost Savings (TRDS) ....
      - Trade Set Up Costs (TFSUC) ....
      - Trade Operating Costs (TFOPC) ....
      = Disposal Systems Surplus (TTST) ....

   c. Total Systems Surplus (TTTS)

      Revenue (TTRA) ....
      + Disposal Cost Savings (TRDS) ....
      + Changes In Collection Costs (TCH) ....
      - Trade Set Up Costs (TFSUC) ....
      - Trade Operating Costs (TFOPC) ....
      = Total Systems Surplus (TTTS) ....

3. Meets Extra Costs

a. Operating Surplus (TMPT)

Revenue (TTRA) ....
- Trade Set Up Costs (TFSUC) ....
- Trade Operating Costs (TFOPC) ....
= Operating Surplus (TMPT) ....

b. Disposal Systems Surplus (TMST)

Revenue (TTRA) ....
+ Disposal Cost Savings (TRDS) ....
- Trade Set Up Costs (TFSUC) ....
- Trade Operating Costs (TFOPC) ....
= Disposal Systems Surplus (TFST) ....

c. Total Systems Surplus (TMTS)

Revenue (TTRA) ....
+ Disposal Cost Savings (TRDS) ....
+ Changes In Collection Costs (TCH) ....
- Trade Set Up Costs (TFSUC) ....
- Trade Operating Costs (TFOPC) ....
= Total Systems Surplus (TMTS) ....

Appendix H

Investment Appraisal For Proposed Glass Recovery Schemes

Appendix H

Investment Appraisal For A Proposed Glass Recovery Scheme

H.1 Introduction

Once a recovery scheme has been set up the capital investment has already been committed, with the operator being faced with loan repayments as well as the operating costs that the scheme incurs. Thus at the outset the operator of a reclamation scheme as with any other capital project should consider whether the benefits from the scheme over its operational life will justify the capital expenditure that is necessarily incurred.

With glass recovery schemes capital expenditure is limited to: skips, storage, vehicles and crusher units. Compared to other waste management options such as transfer stations or resource recovery plants expenditure on recovery schemes is relatively small.

As with the viability model, a separate assessment of domestic recovery and trade glass recovery schemes have been considered.

H.2 The Discounted Cash Flow Method

The Discounted Cash Flow (DCF) technique allows an investor to make an informed choice to be made in conditions where cash flows of different sizes occurring in different time periods need to be considered.

Generally, a decision to invest in a project puts off consumption. Resources invested today provide consumption goods for the future. Alternatively, by consuming today Society forgoes the goods that investment would have provided in a future time period. Society has to make a trade off between the consumption of goods now and in the future, through the contol of the level of investment that is encouraged.

The DCF technique takes account of the time value of money. The approach finds the present value of the expected net cash flows of an investment, discounted at the cost of capital and subtract from it the initial cost outlay of the project. If the Net Present Value (NPV) is positive the project should be accepted, if the NPV is negative, it should be rejected. If two projects are examined for the same task, the one with the higher net present value should be given preference (WESTON & BRIGHAM 1978).

The DCF technique involves the discounting of future cash flows, C; for each year of life of a project for N years; to a current or base year by using a certain discount factor, r; to give a Present Value for that investment. The discount factor is the interest that would be paid on money deposited in a savings account had it not been invested. The discounted net revenue for each year is then summed up to determine net present value of the project.

H.3 The Equation for Net Present Value (NPV) is given by:

$$NPV = \frac{C}{(1+(r/100)}$$

Cash flows are positive (+ve) if in-coming and negative (-ve) when out-going. A negative value for NPV means that a net loss is incurred overall by the project.

The decision on whether to proceed with the scheme depend on whether NPV is positive or negative. If a positive NPV is achieved the scheme should proceed, except where operator has a limited capital budget and alternative uses for the capital would attain a higher NPV for capital invested. This technique enables managers to assess the various waste management options, eg investment in new landfill sites, incineration and reclamation schemes. The DCF technique allows the alternative options to be compared and ranked in order by their NPV value. The project with the better NPV (highest NPV, or lowest cost) would normally be ranked first.

Capital expenditure should only be those directly needed by the project. No account need or should be taken of any capital expenditure of previous investment decision, however recent or expensive.

Reclamation scheme's costs and revenue flows are based on direct cost and revenue components and indirect costs and savings discussed in terms of the viability of recovery schemes. These have to be estimated for each year of the investment period. The time period chosen usually reflects the life of the largest element of capital plant that has to be purchased.

H.4 Inflation

Changes in the general level of prices over time has an important effect on the financial viability of proposed recovery schemes, as it is unlikely to affect all expenditure and revenue flows in the same way.

Price received for the cullet reflects changes in the raw material prices to the industry. If price received remains static over a period, this would decrease in real terms over the period of the project. Over the life of the Bottle Bank system prices received for recovered glass has risen steadily from £10 per tonne in 1977 to £20 per tonne in 1985 in line with the rise in prices of raw materials for the industry.

Recently labour costs, have stayed in line with inflation. This is particularly so in the Council sector, where wage negotiations are influenced by Government policy. In the past years labour rates have been slightly above the inflation rate, particularly in the private sector.

Problems with price fluctuations in the future can be minimised by evaluating a recovery scheme in terms of constant prices. Thus rather than changes in current money prices which incorporate the inflation rate, only relative price changes need to be incorporated into the estimates. In general the costs associated with the recovery scheme are assumed to rise in line with general price levels so that their relative prices will remain constant. Thus if labour costs have risen faster than general price levels by 5% over the investment period, then allowance for this change will be made by increasing labour figures by 5% annually.

H.5 Depreciation

With the DCF technique capital expenditure is assessed in the year that is incurred. At the start of a proposed project, the base year, the amount of capital expenditure envisaged will be known with a reasonable degree of certainty.

It is not necessary in an investment appraisal to include provision for depreciation payments to service that capital in subsequent years, as the use of depreciation in accounting is in effect a book keeping exercise. Depreciation spreads the capital cost over the life of the project. Depreciation is therefore ignored in an investment appraisal as it is not a cash flow, as the aim of the DCF technique is to relate all cash flows to a single point in time.

H.6 Interest

The discount rate adopted under the DCF technique acts with the same purpose as the inclusion of interest charges on the estimated expenditures. Discount and interest rates adjust future cash flows, both positive and negative, to bring them to a comparable basis. Interest rates achieve this by compensating the lender for any 'loss' arising from having his purchasing power pushed forward to a future time period. The discounting process seeks to convert future cash flows into their present value equivalent.

H.7 Sensitivity Analysis

Any investment assessment has to be flexible in predicting cash flows that will affect the reclamation scheme. The amount of waste materials available is based on predictions of waste arising in a given area and on socio-economic factors. Cash flows are based on perceptions of future changes in relative costs and prices where there may be large amounts of uncertainty about their magnitude. These will be based on present trends, past practices and future predictions.

Fluctuations in the main items such as revenue received and labour costs may have a significant impact on the viability of the proposed reclamation scheme. To reduce the uncertainty of estimates used in investment appraisal, sensitivity analysis should be carried out to assess the influence on NPV on changes in some of the key cashflow factors. It is important to assess a recovery scheme under a range of foreseeable alternatives, as once a capital project is underway, there will be considerable difficulties in terminating the recovery scheme.

H.8 Applying The Investment Appraisal Model

A model has been devised for a glass recovery scheme from domestic sources and a separate one for glass recovered from trade sources. These have been discussed separately below. They have been developed from the work of HO (1982) on the recovery of paper from municipal wastes. More detailed NPV models have been produced by WILSON (1980) for waste management modelling and planning, based on the work of ALLEN (1976) in the refining industry.

H.9 Investment Model - Domestic Glass Recovery

H.9.1 Introduction

Many characteristics of the hypothetical local authority described in Chapter 10 are used in the investment appraisal model. Three additional factors have to be incorporated: Feasibility Study, Length Of The Investment Period, and the Choice of Discount Rate.

H.9.2 Feasibility Study

A Feasibility Study (FST) is important in establishing the level of public response and the likely costs and benefits of the scheme. Such a study should examine:

- Population - size, density, & location
- Domestic Premises - Number, location
  - Social Groupings
- Suitable Sites - access to sites
  - liase with owners
  - planning permission
- Markets For Recovered Material - Identification
  - Revenue
  - Distance
- Council Infrastructure - Type of vehicles
  - Storage Facilities
  - Labour
- Costs & Benefits Of The Scheme

On the basis of this information a decision can be made on the suitability of introducing a materials recovery scheme to a Council's area. In addition a manager can consult other authorities to see how schemes work and what would be best for his area. He could also make use of the previous viability model to see how a scheme might run and the following investment model to assess the outcomes of such an enterprise. Costs will be based on time taken by the manager to carry out the survey (FST = FA * FH).

H.9.3 Investment Period

The length of time chosen to assess an investment is generally based on the working life of the highest value asset. In a recovery scheme the main costs are: Bottle Banks at £746 each or £5968 for 8 banks, vehicle costs range from £20,000 to £37000, storage costs range up to £4000, and crusher costs could be a £1000. The main cost factor would be for vehicles and Council's have spread costs over 7 to 8 years, although a recent Audit Commission report has indicated Council's using lorries for longer periods up to 10 years. The next main cost of Bottle Banks are spread over 5 years in the viability model, although operators anticipate a life of 10 years and with care 15 years. Storage bays being well constructed should have a similar life of other built structures, with WILSON sugesting at least 30 years.

Most of the DOE's evaluation of waste management projects are based on a 10 year investment period. As costs are relatively small, the investment model uses a project life of 10 years, with capital investment occurring in year zero.

H.9.4 Choice Of Discount Rate

Economists have chosen between two discount rates:

1. Social Time Preference Rate (STPR)
   - This is based on the amount of consumption necessary in the future to compensate society for the sacrifice of present consumptions. This rate is often difficult to determine.

2. Social Discount Rate (SDR)
   - This is more commonly used in the Public Sector.

The role of discount rate is to ensure that the correct allocation of investment resources between public and private sectors of the economy. Where investment funds are limited, investment in the public sector of the economy can displace investment undertaken by the private sector. Since it is rare that society will direct funds from a high return to a low return public sector project, it can be argued that the same discount rate can be used in public as in the private sector.

The discount rate to be used in the public sector appraisal is the Social Opportunity Cost (SOC) of investment funds.

SOC discount rate is set to the real rate of return on marginal low risk projects undertaken by private industry on the rationale that this will be what money can earn if it has not been invested in public sector projects. Despite not being totally satisfactory measure its definition suggests that the SOC rate is higher than that taken to reflect STPR.

In Britain, all public sector investment are evaluated using the Treasury test discount rate, set periodically as SOC. In practice, use to choose between alternative ways of doing the same thing, or to determine the composition of an investment programme within a budget constraint.

Besides the two Social Discount Rates, the Local Authority can use a commercial rate of return and interest rate at which the Authority may borrow. DOE (1976) recommended the use of a 10% discount factor. But WMAC (1979) used 5% discount rate folowing the publication of the Government's White Paper on Nationalised Industries (Cmnd 7131).

H.9.5 Computer Runs

Figure H.A shows the flowsheet for the investment appraisal of Bottle Bank reclamation schemes. It is split into two subroutines COSTS and CASHFLOW. Subroutine COSTS carries out the basic calculations as with the viability model and subroutine CASHFLOW puts these elements into a tabular form, to produce the cashflows and then outputs them in table form to allow easy access of the information. The Fortran Program and Flow Sheet for the glass recovery by Bottle Banks is shown in Appendix H.12.

The program reads in certain household participation percentage (M=20%) and a waste contribution level (W=1kg per week per household). These elements combine to give the gross tonnage recovered (GRT=508 tonnes) which is used i. aspects of the calculation.

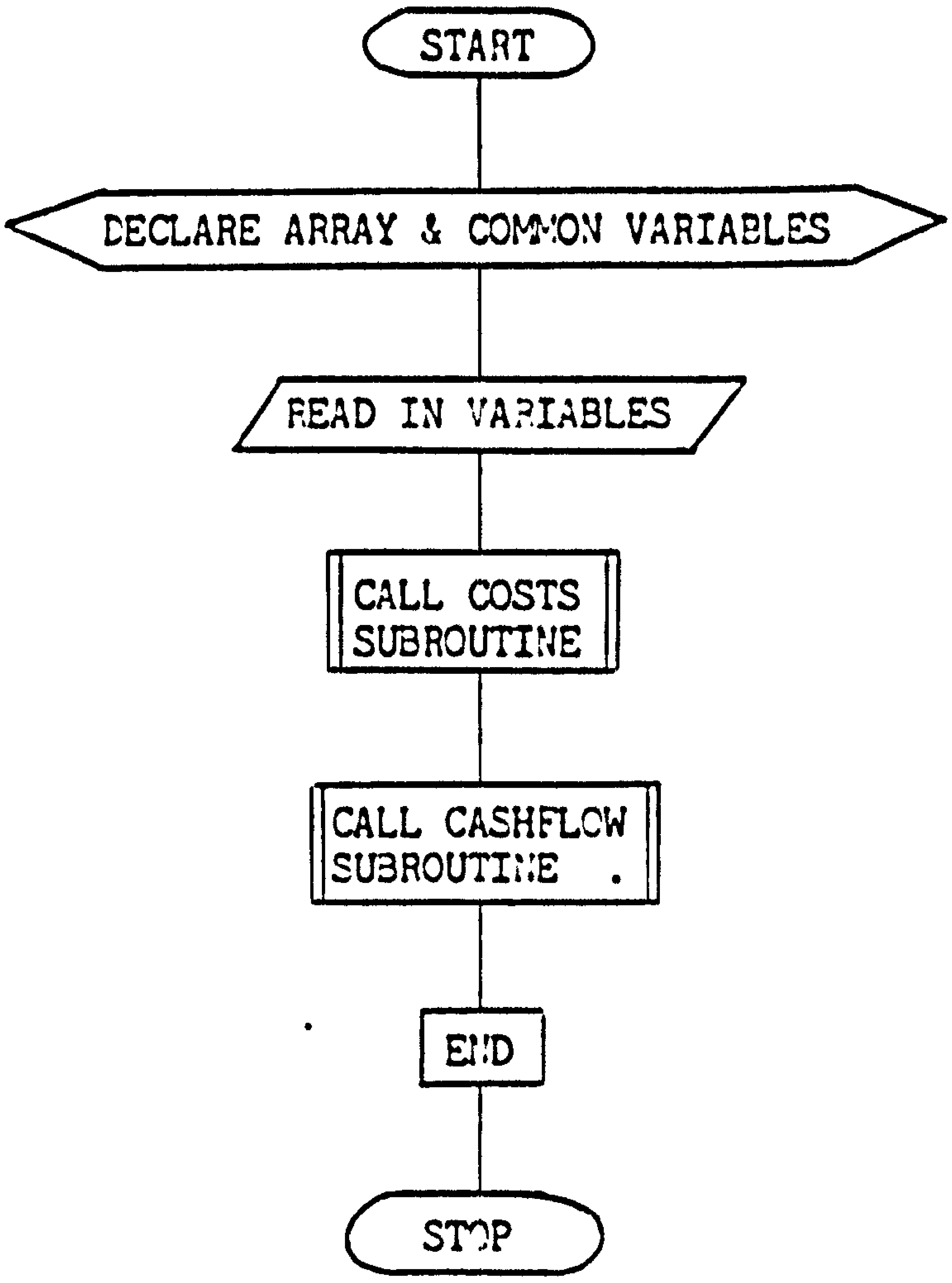
The same elements from the viability model (Chapter 10) are read in and calculated to give cashflows. From these, the net costs are produced for each year and discounted at 5% to give the present value. These are summed to give the Net Present Value (NPV). A NPV can be calculated for a scheme on the basis of private costs, disposal costs and total system including collection costs. This allows for an Officer to make allowances to meet his own operating conditions.

The results of the investment model are shown in Section H.14. At 5% discount rate on a private viability basis the scheme has a positive NPV of £33,008. This is increased to £38,578 if disposal savings are included and £113,094 if collection savings are incorporated. With this positive value for NPV investment in the recycling project could be justified.

If participation rates and waste generation levels are altered this will affect the NPV value achieved and needs to be examined. In addition different discount rates should be examined, as well as effects of changes in some of the key costs.

As capital costs are relatively small in year 0, the life of the project has little effect provided revenue exceeds operating costs.

FIGURE H.A Flow Diagram For Investment Appraisal Of A Glass Recycling Scheme



H.10 Investment Model - Trade Glass Recovery

H.10.1 Introduction

This investment appraisal of trade recovery schemes follows on the lines adopted for the domestic recovery scheme (Section H.9). Again it draws on the factors introduced for the hypothetical study looked at in terms of the trade viability model (Chapter 11). As with the domestic model three additional factors need to be included, which are: Feasibility Study, Investment Period and the Choice Of Discount Rate. These have been explained in Section H.9 for the domestic investment appraisal. The Fortran program and the flow sheets are shown in Section H.15.

H.10.2 Computer Run

Figure H.8 shows the flow sheet for the investment appraisal of trade schemes. It is split into four subroutines: COSTS, CASHFULL, CASHSHARE and CASHEXTRA. The COSTS subroutine carries out the basic calculations for set up costs and operating costs setting them against income. The next three subroutines print out the different options: for meeting Full Costs, Sharing Costs and meeting Extra Costs. The outputs called for depend on the requirements needed by operators. The program reads in the total number of trade premises, the number of traders participating (Z=30%) and the level of waste generated (X=29kg per premises per week). These elements combine to give the gross total of trade glass recovered (TRT= 90 tonnes).

The same elements from the trade viability model are read in and used to calculate set up costs and operating costs. From these, the cash flows are produced for each year and are offset against anticipated income. These net costs are discounted at 10% to poduce present values for each year, which are then summed to give the Net Present Value.

For each case an assessment can be made for a scheme meeting the full costs of its operations, sharing the costs, or just meeting the extra costs it might incur. Again for each case assessments are made for meeting private vaibility, disposal systems surplus and total systems surplus.

The results from running the computer model for trade recovery are shown in Appendix H.17. For a system meeting Full Costs a scheme would have a negative NPV of £242,775. This would be slightly improved with the inclusion of disposal and collection savings. However, this would not bring the scheme into a position of a positive NPV.

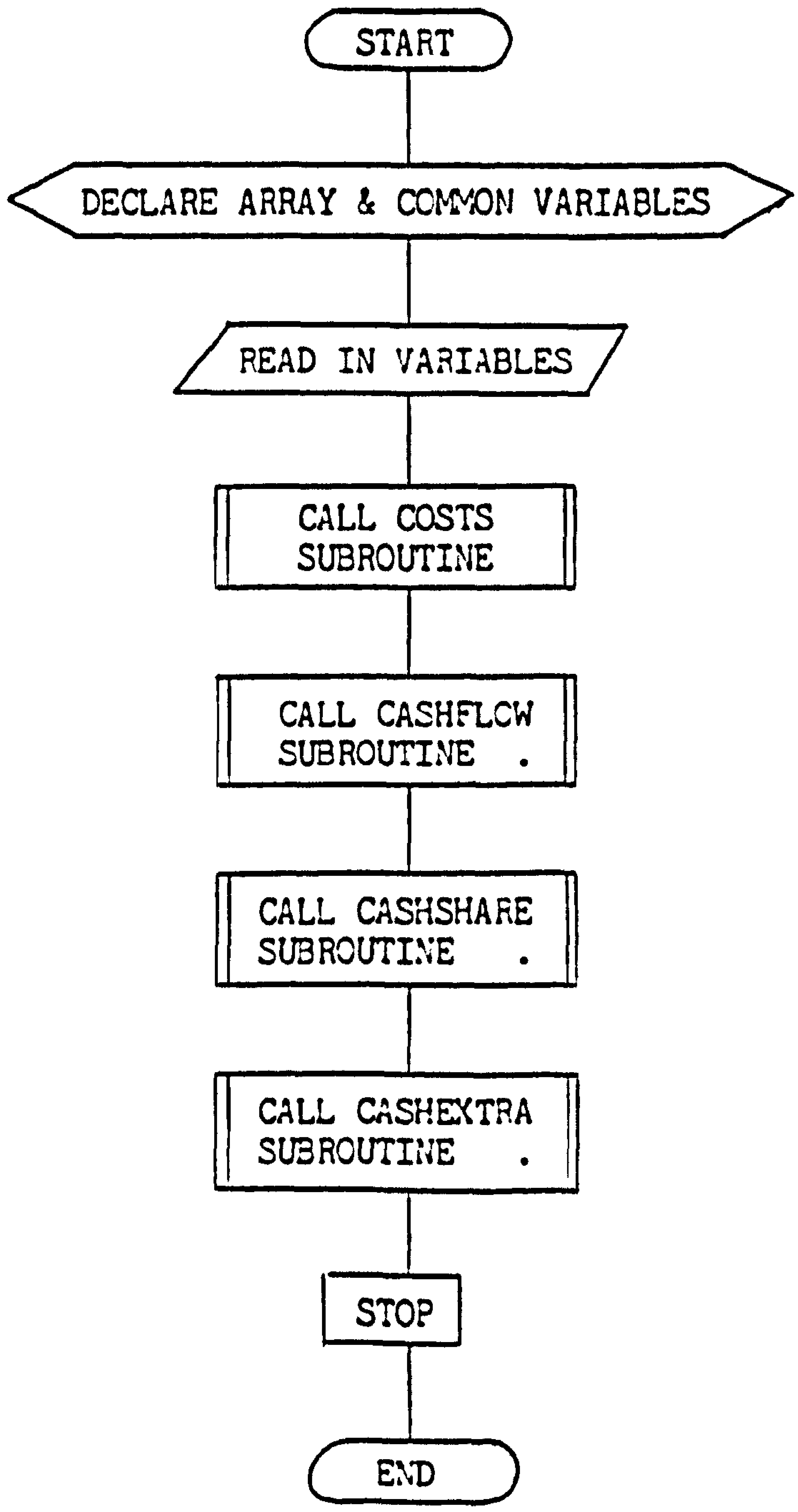
A scheme sharing costs would have a negative NPV of £45,758. Again including disposal and collection savings would improve this assessment. Just meeting the extra costs brings a trade recovery scheme into a positive NPV of £4022. A small return on investment.

These figures reflect the outcome of the viability assessments. It is important to be clear on what base schemes are assessed when conducting any appraisal for future investment decisions.

Within a waste management system there are many options for handling waste and each needs to be considered. Using NPV allows the manager to rank options to choose a project that has the highest NPV or the lowest negative value. So a project producing a loss of £242,000 might be the best option available to handle the waste. Thus NPV can provide an important management tool.

Again sensitivity analysis needs to be carried out, changing key elements to see the effect. Assessing relative prices and increases due to inflation. Also look at effects of changes in discount rate and length of investment.

FIGURE H.B Flow Diagram For Trade Investment Appraisal Model



H.11 Summary Of Investment Models

The Investment Models can be used by Local Authorities to establish the future viability of glass recovery schemes. Dependant on the NPV achieved will be decisions made on the future of investment in to reclamation schemes. Such decisions need to be made in light of other investment requirements of the waste management system.

With most investment decisions on waste management projects the NPV is likely to be negative. Whether the Local Authority builds a new incineration plant or landfill site they will be looking for the most cost effective system best suited to local conditions.

As with the viability model the impact of savings in collection costs and disposal costs are considered. For the Bottle Bank system a positive NPV is shown. For Trade Schemes the three cost options are examined. In this case it is only under the Extra Cost Option that a positive NPV is recorded. Under each system the effects of changes in the cost components, interest rates and project life should be considered.

Decisions on investment in recycling schemes need to be made in the context of the whole waste management system.

```
C       Investment Appraisal For A Glass Recycling Scheme
        COMMON /INV1/ CF(50,20), TABLE(50,20)
        INTEGER AC
        COMMON /INV2/ ID,IP,Y,C,R,D,M,W
        COMMON /INV3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
        COMMON /INV4/ SKA,TAR,RAI,KL,CPR
        COMMON /INV5/ N,KC,B,BC,NMD,CMD,NSP,CSP
        COMMON /INV6/ KS,RV,UP,CAP,FU
        COMMON /INV7/ SIC,SKC,STC,UPC,CRC,SUC
        COMMON /INV8/ H,E,SKM,A,TR,TL,WS,TS
        COMMON /INV9/ LAB,FUEL,MAIN
        COMMON /INV10/ CC,SM,KA,PUB,BUT,STM,CUC
        COMMON /INV11/ GRT,TRA,SRD,SRC
        COMMON /INV12/ DFP,PNPV,SNPV,TNPV
        READ(37,*)ID,IP,Y,C,R
        READ(37,*)N,KC,B,BC,NMD,CMD,NSP,CSP
        READ(37,*)KS,RV
        READ(37,*)SKA,TAR,RAI,KL,L,CPR
        READ(37,*)A,H,E,SKM,TR,TL
        READ(37,*)P1,P2,P3,P4
        READ(37,*)PCG,PGG,PAG,PMG
        READ(37,*)D
        READ(37,*)M,W,DFP
C       M = Percentage Of Household Participation
C       W = Contribution Per Household Per Week (Kg)
C       DFP = Discount Factor
        CALL COSTS
        CALL CASHFLOW
        STOP
        END
        SUBROUTINE COSTS
        COMMON /INV1/ CF(50,20),TABLE(50,20)
        INTEGER AC
        COMMON /INV2/ ID,IP,Y,C,R,D,M,W
        COMMON /INV3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
        COMMON /INV4/ SKA,TAR,RAI,KL,CPR
        COMMON /INV5/ N,KC,B,BC,NMD,CMD,NSP,CSP
        COMMON /INV6/ KS,RV,UP,CAP,FU
        COMMON /INV7/ SIC,SKC,STC,UPC,CRC,SUC
        COMMON /INV8/ H,E,SKM,A,TR,TL,WS,TS
        COMMON /INV9/ LAB,FUEL,MAIN
        COMMON /INV10/ CC,SM,KA,PUB,BUT,STM,CUC
        COMMON /INV11/ GRT,TRA,SRD,SRC
        COMMON /INV12/ DFP,PNPV,SNPV,TNPV
C       FEASIBILITY STUDY
        FST=FA*FH
C       SET UP COSTS
C       Site Costs
        SIC=((SKA+TAR+RAI+KL+CPR)*N)
C       Skip Costs
        BKC=N*KC
        BNC=B*BC
        MOD=NMD*CMD
        SPN=NSP*CSP
        SKC=BKC+BNC+MOD-SPN
C       Storage Costs
        STC=KS+RV
C       Upfront Publicity
        UPC=UP*ID
C       Crusher Costs
```

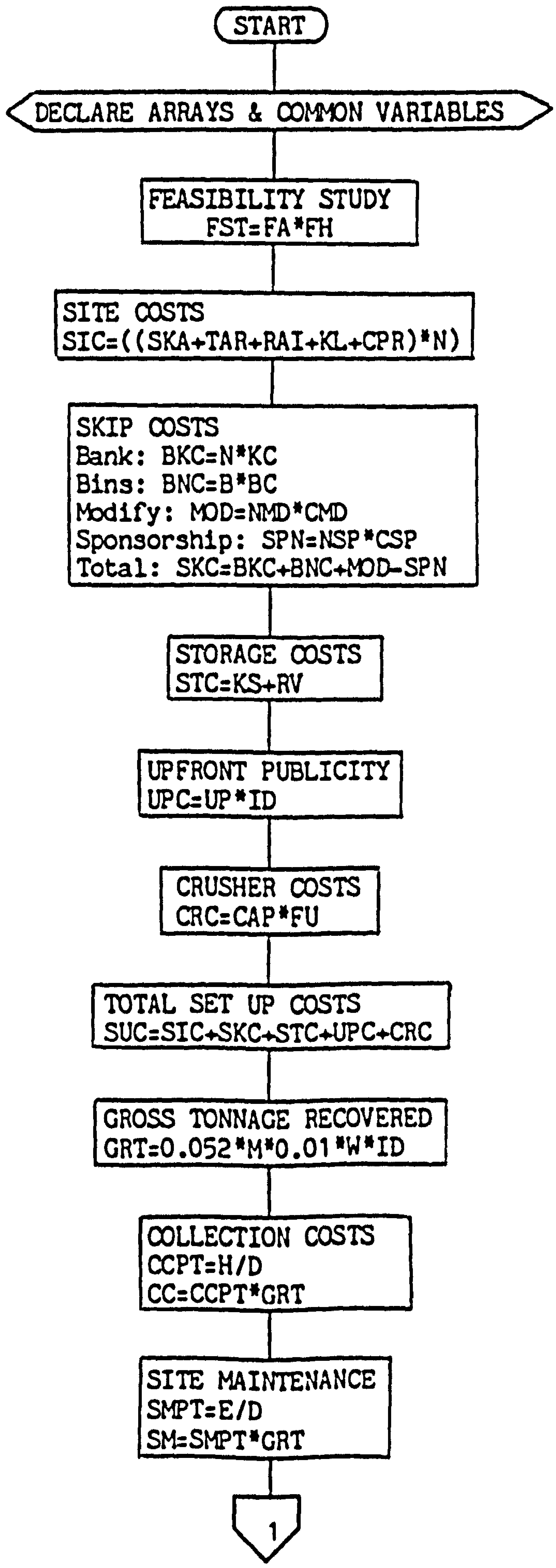
```
      CRC=CAP+FU
C     Total Set Up Costs
      SUC=SIC+SKC+STC+UPC+CRC
C     GROSS TONNAGE RECOVERED
      GRT=0.052*M*0.01*W*ID
C     OPERATING COSTS
C     Collection Costs
      CCPT=H/D
      CC=CCPT*GRT
C     Site Maintenance
      SMPT=E/D
      SM=SMPT*GRT
C     Skip Maintenance
      SKM=N*SKM
C     Administration
      KA=A
C     Publicity Costs
      PUB=0.01*ID
C     Bulk Transport
      BTR=TR+TL
      BUT=BTR*GRT
C     Storage Maintenance
      STM=(WS*TS)
C     Crusher Operating Costs
      CUC=LAB+FUEL+MAIN
C     TOTAL OPERATING COSTS
      OPC=CC+SM+SKM+KA+PUB+BUT+STM+CUC
C     INCOME
C     Sales Revenue (TRA)
      TRS1=P1*PCG*GRT
      TRS2=P2*PGG*GRT
      TRS3=P3*PAG*GRT
      TRS4=P4*PMG*GRT
      TRA=TRS1+TRS2+TRS3+TRS4
C     Savings In Refuse Disposal Costs (SRD)
      SRD=Y*GRT
C     Savings In Refuse Collection Costs (SRC)
      SRC=C*GRT
      RETURN
      END
      SUBROUTINE CASHFLOW
      COMMON /INV1/ CF(50,20),TABLE(50,20)
      INTEGER AC
      COMMON /INV2/ ID,IP,Y,C,R,D,M,W
      COMMON /INV3/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
      COMMON /INV4/ SKA,TAR,RAI,KL,CPR
      COMMON /INV5/ N,KC,B,BC,NMD,CMD,NSP,CSP
      COMMON /INV6/ KS,RV,UP,CAP,FU
      COMMON /INV7/ SIC,SKC,STC,UPC,CRC,SUC
      COMMON /INV8/ H,E,SKM,A,TR,TL,WS,TS
      COMMON /INV9/ LAB,FUEL,MAIN
      COMMON /INV10/ CC,SM,KA,PUB,BUT,STM,CUC
      COMMON /INV11/ GRT,TRA,SRD,SRC
      COMMON /INV12/ DFP,PNPV,SNPV,TNPV
C     CALCULATE CASH FLOWS AND TABULATE THEM
C     SET UP CASH FLOWS
      CF(1,1)=SIC*(-1)
      CF(2,1)=SKC*(-1)
      CF(3,1)=STC*(-1)
      CF(4,1)=UPC*(-1)
```

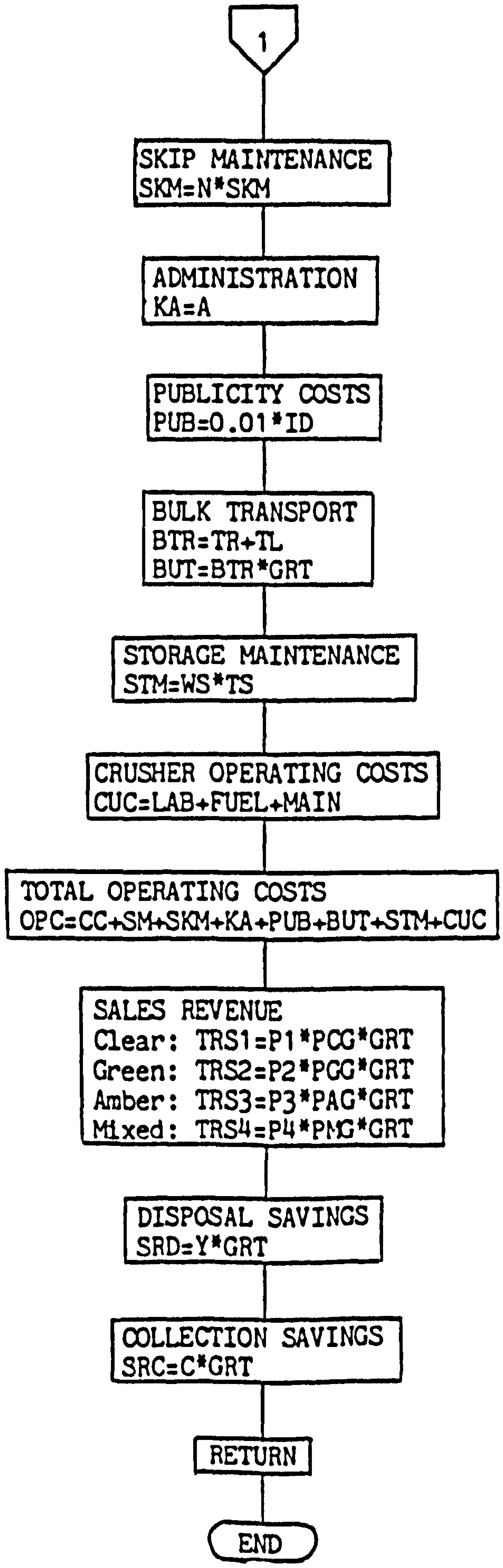
```
      CF(5,1)=CRC*(-1)
C     TOTAL SET UP CASH FLOW
      DO 30 L=1,11
      CF(6,L)=CF(1,L)+CF(2,L)+CF(3,L)+CF(4,L)+CF(5,L)
   30 CONTINUE
C     OPERATING COSTS
      DO 40 L=2,11
      CF(8,L)=CC*(-1)
      CF(9,L)=SM*(-1)
      CF(10,L)=SKM*(-1)
      CF(11,L)=KA*(-1)
      CF(12,L)=PUB*(-1)
      CF(13,L)=BUT*(-1)
      CF(14,L)=STM*(-1)
      CF(15,L)=CUC*(-1)
   40 CONTINUE
C     SUM OF OPERATING COSTS
      DO 60 L=2,11
      CF(16,L)=CF(8,L)+CF(9,L)+CF(10,L)+CF(11,L)+CF(12,L)+CF(13,L)
     C +CF(14,L)+CF(15,L)
   60 CONTINUE
C     TOTAL COSTS
      DO 70 L=1,11
      CF(17,L)=CF(6,L)+CF(16,L)
   70 CONTINUE
C     INCOME
      DO 80 L=2,11
      CF(18,L)=TRA
      CF(19,L)=SRD
      CF(20,L)=SRC
   80 CONTINUE
C     CALCULATE NET EFFECTS (PROFIT/LOSS)
C     Private Viability
      DO 100 L=1,11
      CF(21,L)=CF(18,L)+CF(17,L)
      CF(22,L)=1/(1.0+0.01*DFP)**(L-1)
      CF(23,L)=CF(21,L)*CF(22,L)
  100 CONTINUE
      PNPV=0
      DO 110 L=1,11
  110 PNPV=PNPV+CF(23,L)
C     Disposal Systems Surplus
      DO 120 L=1,11
      CF(24,L)=CF(21,L)+CF(19,L)
      CF(25,L)=1/(1.0+0.01*DFP)**(L-1)
      CF(26,L)=CF(24,L)*CF(25,L)
  120 CONTINUE
      SNPV=0
      DO 130 L=1,11
      SNPV=SNPV+CF(26,L)
  130 CONTINUE
C     Total Systems Surplus
      DO 140 L=1,11
      CF(27,L)=CF(24,L)+CF(20,L)
      CF(28,L)=1/(1.0+0.01*DFP)**(L-1)
      CF(29,L)=CF(27,L)*CF(28,L)
  140 CONTINUE
      TNPV=0
      DO 150 L=1,11
      TNPV=TNPV+CF(29,L)
```

```
  150   CONTINUE
C       PRINT CASH FLOW TABLE AND NET PRESENT VALUE
        WRITE(32,200)
  200   FORMAT('0','Investment Appraisal For A Glass Recovery Scheme'
        WRITE(32,210)
  210   FORMAT(' ','Cash Flows   (   s)')
        WRITE(32,220)(L,L=0,10)
  220   FORMAT('0',22X,11('YEAR',I2,3X))
        WRITE(32,230)FST
  230   FORMAT('0','FEASIBILITY STUDY',2X,F7.1)
        WRITE(32,240)
  240   FORMAT('0','SET UP COSTS')
        WRITE(32,250)CF(1,1)
  250   FORMAT('0','  Site Costs      ',5X,F7.1)
        WRITE(32,260)CF(2,1)
  260   FORMAT('0','  Skip Costs      ',5X,F7.1)
        WRITE(32,280)CF(3,1)
  280   FORMAT(' ','  Storage Costs   ',5X,F7.1)
        WRITE(32,300)CF(4,1)
  300   FORMAT(' ','  Publicity Costs ',5X,F7.1)
        WRITE(32,310)CF(5,1)
  310   FORMAT(' ','  Crusher Costs   ',5X,F7.1)
        WRITE(32,320)CF(6,1)
  320   FORMAT('0','TOTAL SET UP COSTS',5X,F7.1)
        WRITE(32,330)
  330   FORMAT('0','OPERATING COSTS')
        WRITE(32,340)(CF(8,L),L=2,11)
  340   FORMAT('0','  Collection Costs ',10X,10(F8.1,1X))
        WRITE(32,350)(CF(9,L),L=2,11)
  350   FORMAT('0','  Site Maintenance ',10X,10(F8.1,1X))
        WRITE(32,360)(CF(10,L),L=2,11)
  360   FORMAT('0','  Skip Maintenance ',10X,10(F8.1,1X))
        WRITE(32,370)(CF(11,L),L=2,11)
  370   FORMAT('0','  Administration   ',10X,10(F8.1,1X))
        WRITE(32,380)(CF(12,L),L=2,11)
  380   FORMAT('0','  Publicity Costs  ',10X,10(F8.1,1X))
        WRITE(32,390)(CF(13,L),L=2,11)
  390   FORMAT('0','  Bulk Transport   ',10X,10(F8.1,1X))
        WRITE(32,400)(CF(14,L),L=2,11)
  400   FORMAT('0','  Storage Maintenance ',7X,10(F8.1,1X))
        WRITE(32,410)(CF(15,L),L=2,11)
  410   FORMAT('0',',  Crusher Costs   ',10X,10(F8.1,1X))
        WRITE(32,420)(CF(16,L),L=2,11)
  420   FORMAT('0','TOTAL OP COSTS     ',10X,10(F8.1,1X))
        WRITE(32,430)(CF(17,L),L=1,11)
  430   FORMAT('0','TOTAL COSTS        ',2X,11(F8.1,1X))
        WRITE(32,440)
  440   FORMAT('0','INCOME')
        WRITE(32,450)(CF(18,L),L=2,11)
  450   FORMAT('0','Sales Revenue      ',10X,10(F8.1,1X))
        WRITE(32,460)(CF(19,L),L=2,11)
  460   FORMAT('0','Disposal Savings   ',10X,10(F8.1,1X))
        WRITE(32,470)(CF(20,L),L=2,11)
  470   FORMAT('0','Collection Savings ',10X,10(F8.1,1X))
        WRITE(32,480)(CF(21,L),L=1,11)
  480   FORMAT('0','Private Surplus    ',2X,11(F8.1,1X))
        WRITE(32,490)DFP
  490   FORMAT('0','Discount At',F5.1,'%')
        WRITE(32,500)(CF(22,L),L=1,11)
  500   FORMAT('+',20X,11(F8.3,1X))
```

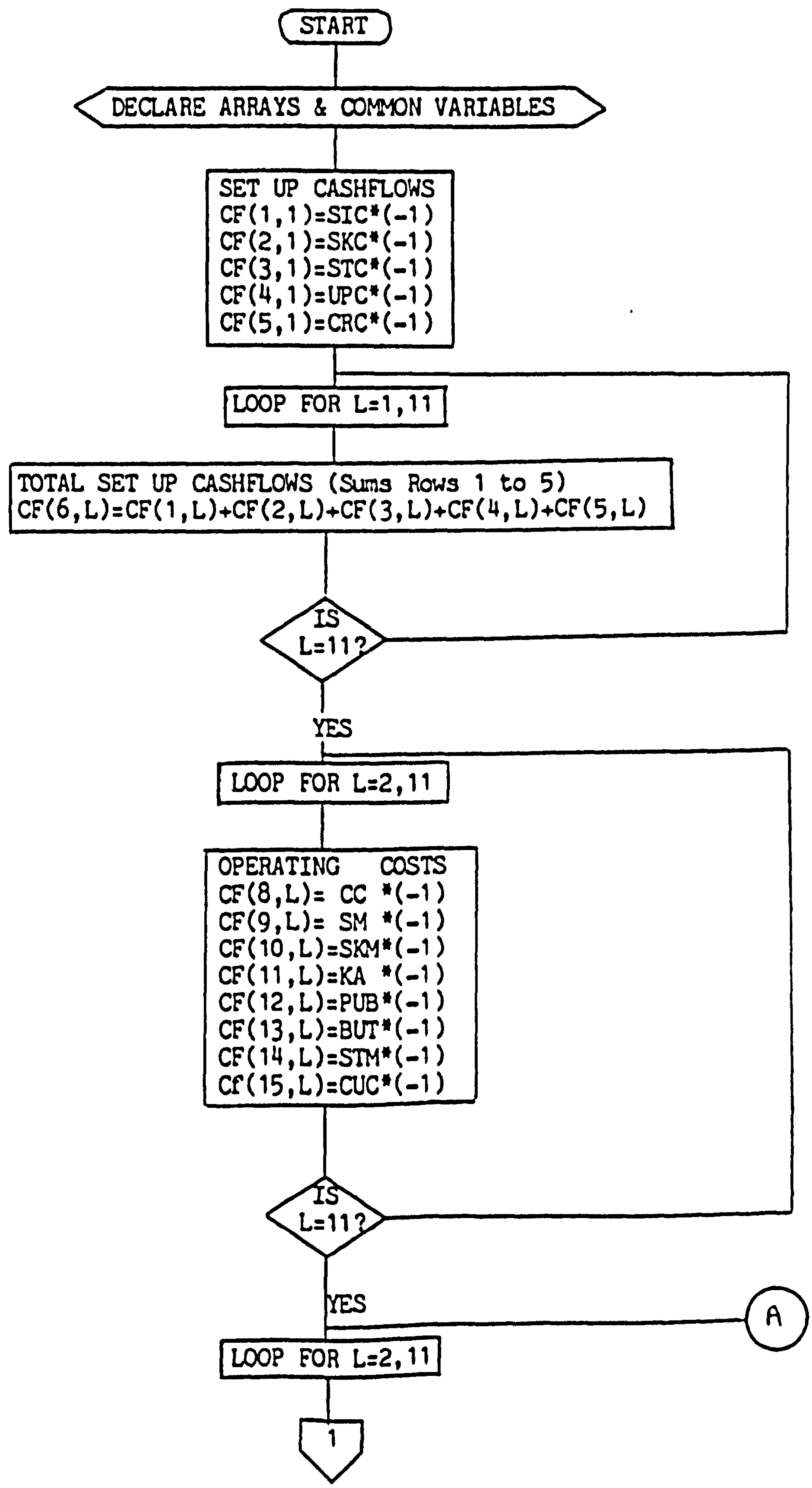
```
      WRITE(32,510)(CF(23,L),L=1,11)
510   FORMAT('0','Present Value        ',2X,11(F8.1,1X))
      WRITE(32,520)PNPV
520   FORMAT('0','Net Present Value =',F12.2)
      WRITE(32,530)(CF(24,L),L=1,11)
530   FORMAT('0','Systems Surplus      ',5X,11(F8.1,1X))
      WRITE(32,540)DFP,1.000
540   FORMAT('0','Discount At ',F5.1,'%')
      WRITE(32,550)(CF(25,L),L=1,11)
550   FORMAT('+',20X,11(F8.3,1X))
      WRITE(32,560)(CF(26,L),L=1,11)
560   FORMAT('0','Present Value',5X,11(F8.1,1X))
      WRITE(32,570)SNPV
570   FORMAT('0','Net Present Value = ',F12.2)
      WRITE(32,580)(CF(27,L),L=1,11)
580   FORMAT('0','Total Surplus ',1X,11(F8.1,1X))
      WRITE(32,590)DFP,1.00
590   FORMAT('0','Discount Factor At ',F5.1,1X,F5.3,1X)
      WRITE(32,600)(CF(28,L),L=1,11)
600   FORMAT('+',15X,11(F8.3,1X))
      WRITE(32,610)(CF(29,L),L=1,11)
610   FORMAT('0','Present Value ',5X,11(F8.1,1X))
      WRITE(32,620)TNPV
620   FORMAT('0','Net Present Value =',F12.2)
      WRITE(32,630)M
630   FORMAT('0','Household Participation Rate =',I3,' Percent')
      WRITE(32,640)W
640   FORMAT('0','Average Weight Per Household Per Week = ',F5.1,'K
      WRITE(32,650)GRT
650   FORMAT('0','Recovered Glass Waste =',F9.2,' Tonnes')
      WRITE(32,660)P1,P2,P3,P4
660   FORMAT('0','P1 =',F7.2,'P2 =',F7.2,'P3 =',F7.2,'P4 =',F7.2)
      WRITE(32,670)PCG,PGG,PAG,PMG
670   FORMAT('0','PCG=',F7.2,'PGG=',F7.2,'PAG=',F7.2,'PMG=',F7.2)
      END
```

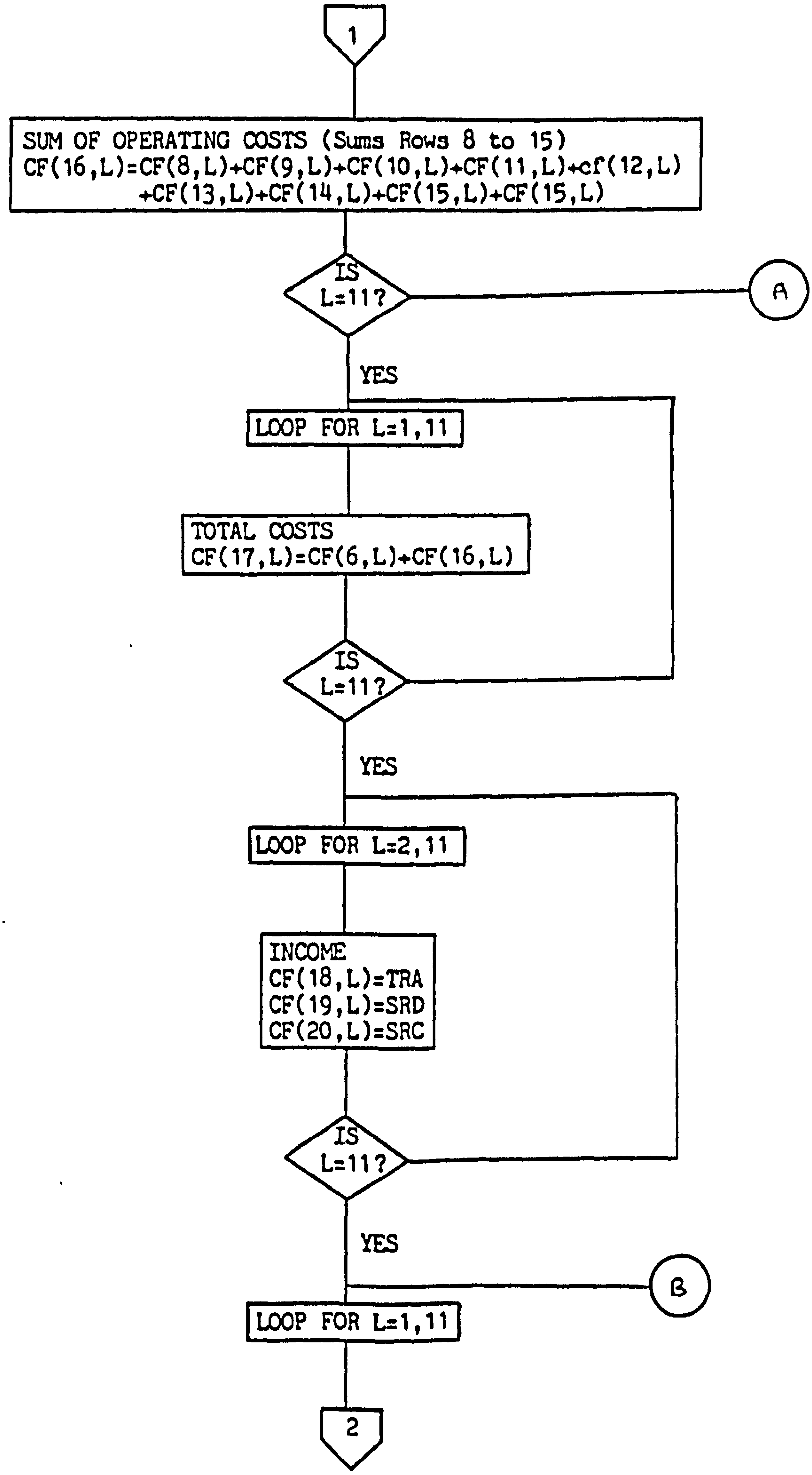
Subroutine Costs

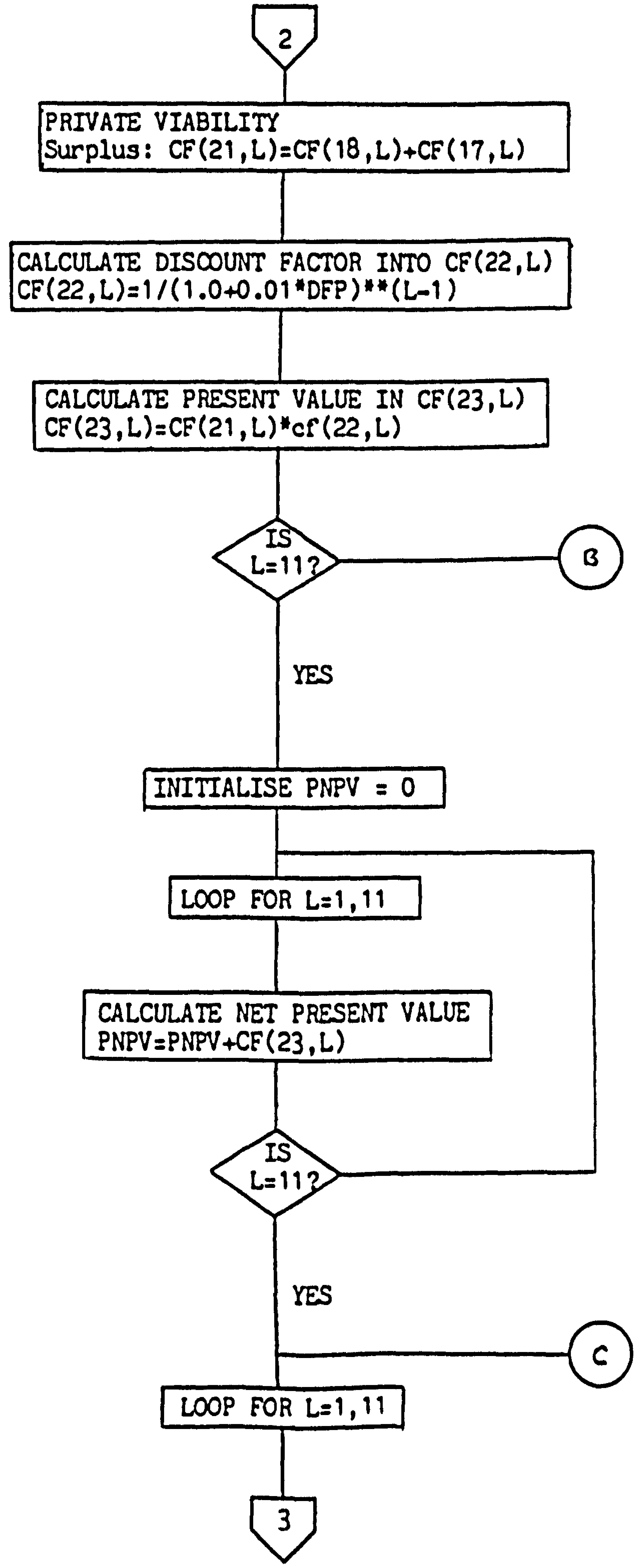


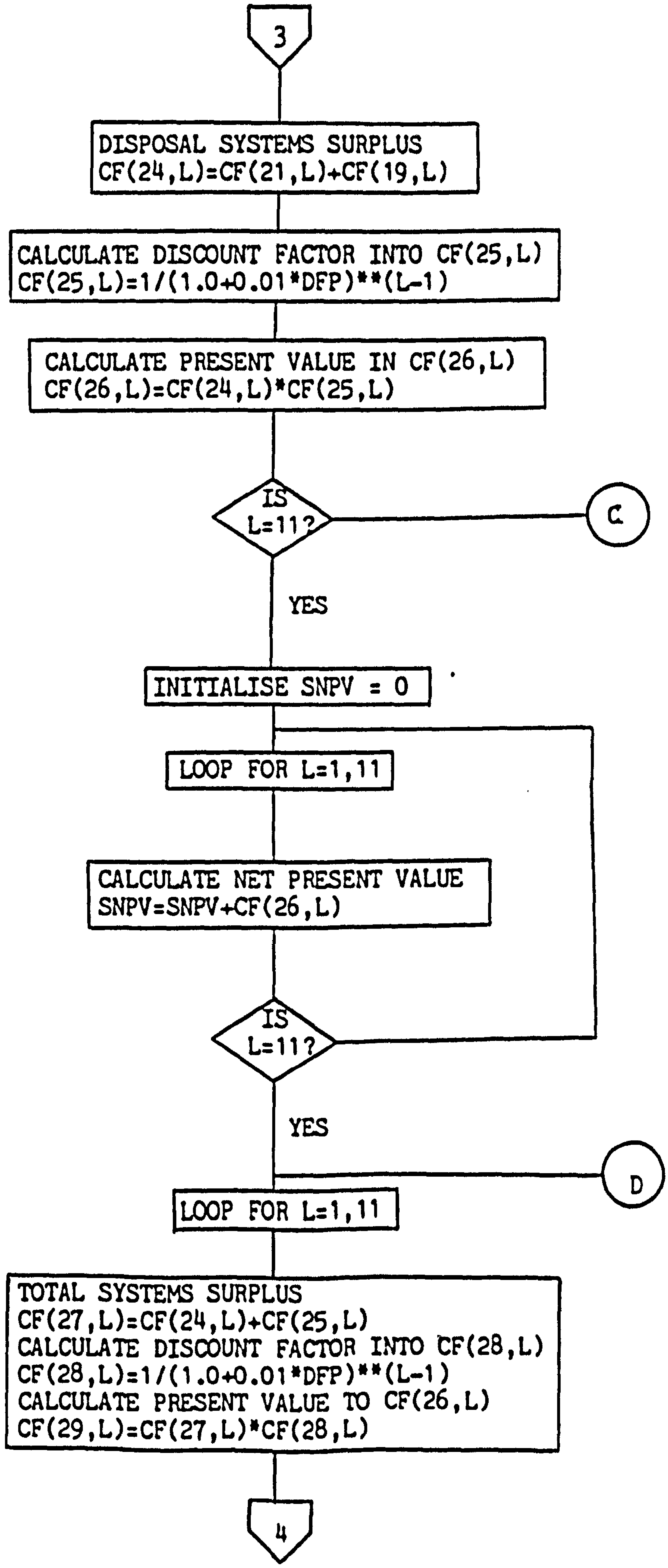

1
SKIP MAINTENANCE
SKM=N*SKM
ADMINISTRATION
KA=A
PUBLICITY COSTS
PUB=0.01*ID
BULK TRANSPORT
BTR=TR+TL
BUT=BTR*GRT
STORAGE MAINTENANCE
STM=WS*TS
CRUSHER OPERATING COSTS
CUC=LAB+FUEL+MAIN
TOTAL OPERATING COSTS
OPC=CC+SM+SKM+KA+PUB+BUT+STM+CUC
SALES REVENUE
Clear: TRS1=P1*PCG*GRT
Green: TRS2=P2*PCG*GRT
Amber: TRS3=P3*PAG*GRT
Mixed: TRS4=P4*PMG*GRT
DISPOSAL SAVINGS
SRD=Y*GRT
COLLECTION SAVINGS
SRC=C*GRT
RETURN
END

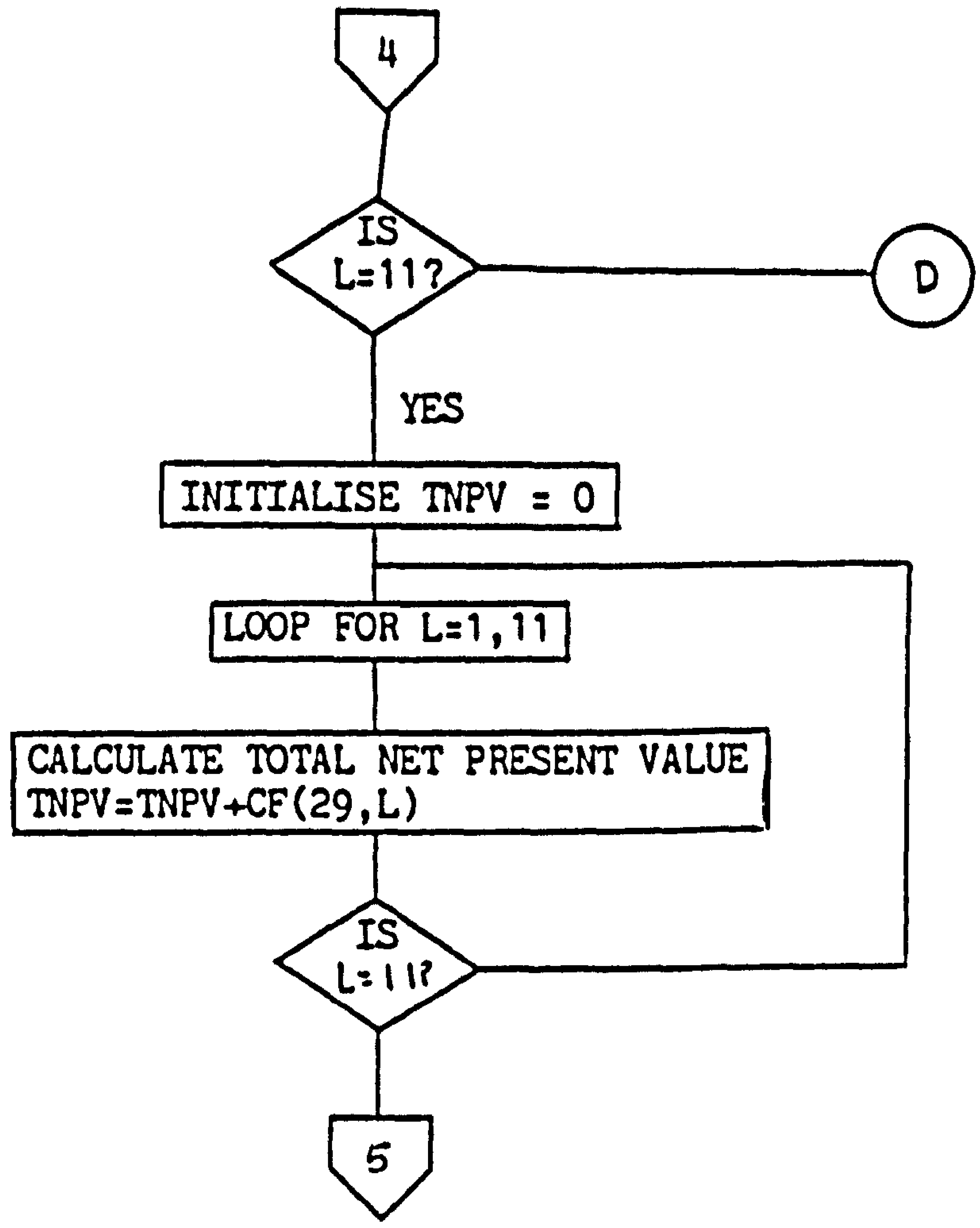
SUBROUTINE CASHFLOW



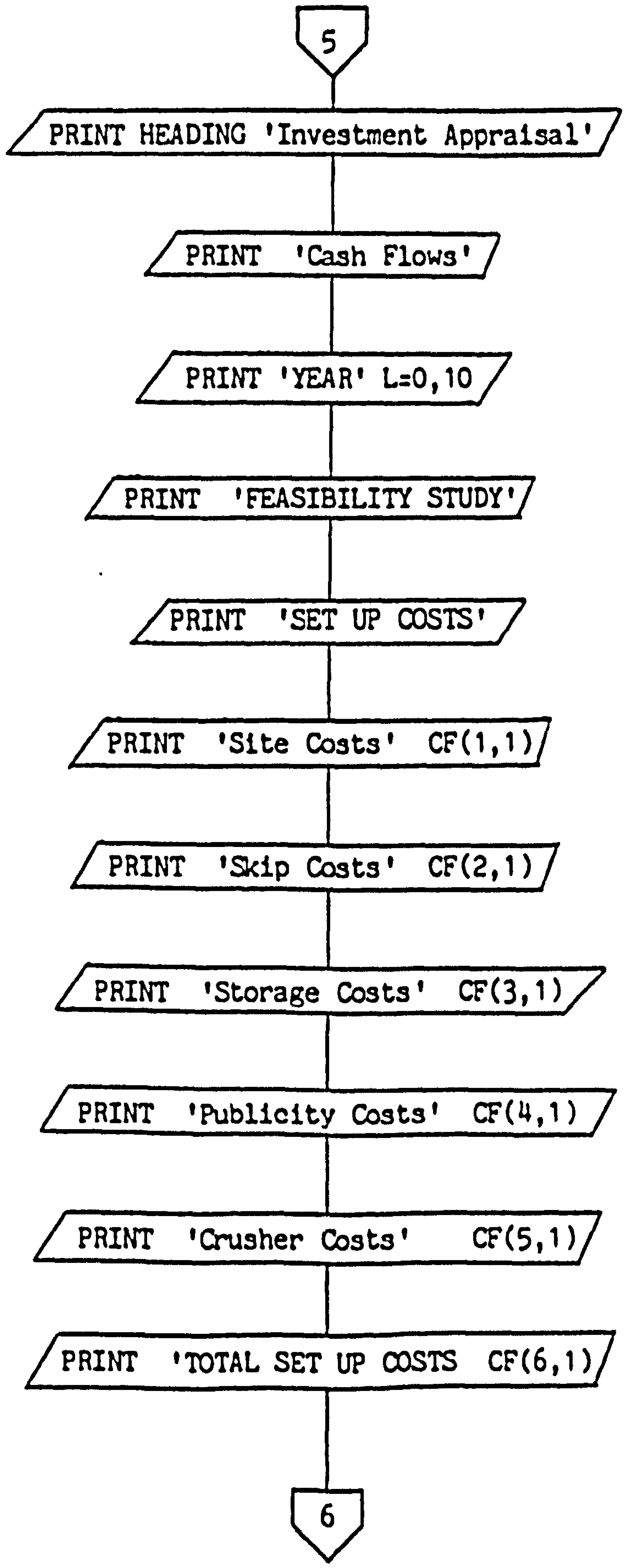

1
SUM OF OPERATING COSTS (Sums Rows 8 to 15)
CF(16,L)=CF(8,L)+CF(9,L)+CF(10,L)+CF(11,L)+cf(12,L)
+CF(13,L)+CF(14,L)+CF(15,L)+CF(15,L)
IS L=11?
A
YES
LOOP FOR L=1,11
TOTAL COSTS
CF(17,L)=CF(6,L)+CF(16,L)
IS L=11?
YES
LOOP FOR L=2,11
INCOME
CF(18,L)=TRA
CF(19,L)=SRD
CF(20,L)=SRC
IS L=11?
YES
B
LOOP FOR L=1,11
2

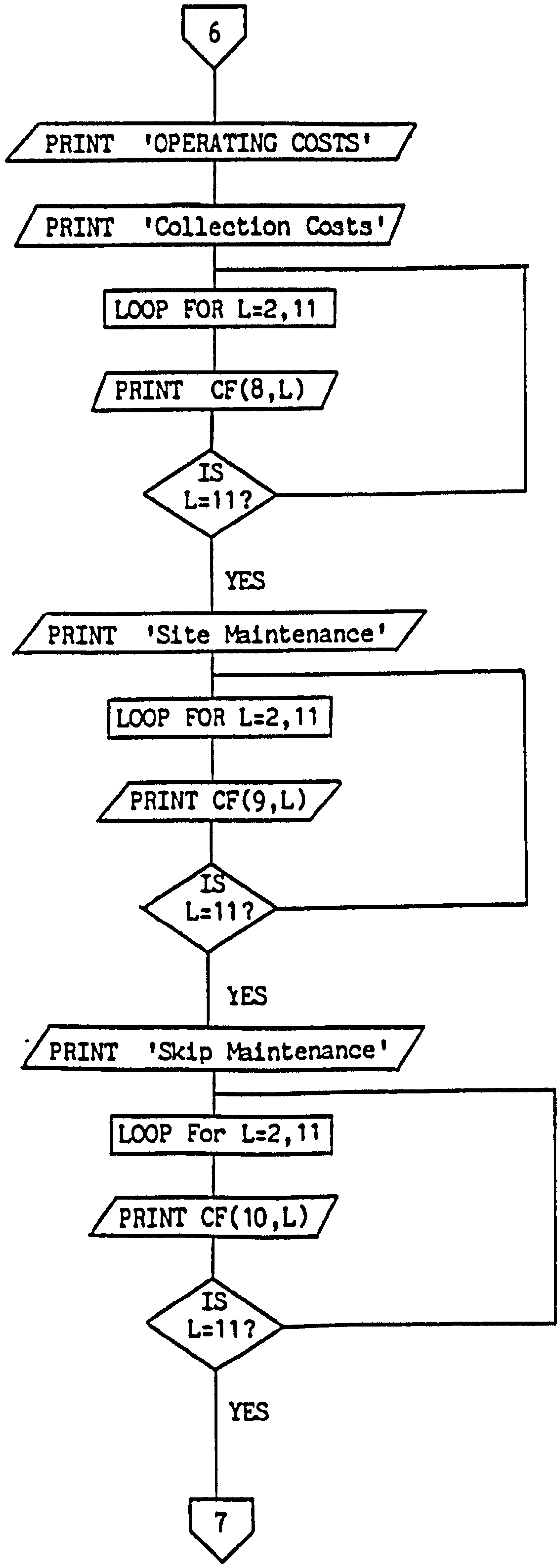

2
PRIVATE VIABILITY
Surplus: CF(21,L)=CF(18,L)+CF(17,L)
CALCULATE DISCOUNT FACTOR INTO CF(22,L)
CF(22,L)=1/(1.0+0.01*DFP)**(L-1)
CALCULATE PRESENT VALUE IN CF(23,L)
CF(23,L)=CF(21,L)*cf(22,L)
IS L=11?
B
YES
INITIALISE PNPV = 0
LOOP FOR L=1,11
CALCULATE NET PRESENT VALUE
PNPV=PNPV+CF(23,L)
IS L=11?
YES
C
LOOP FOR L=1,11
3

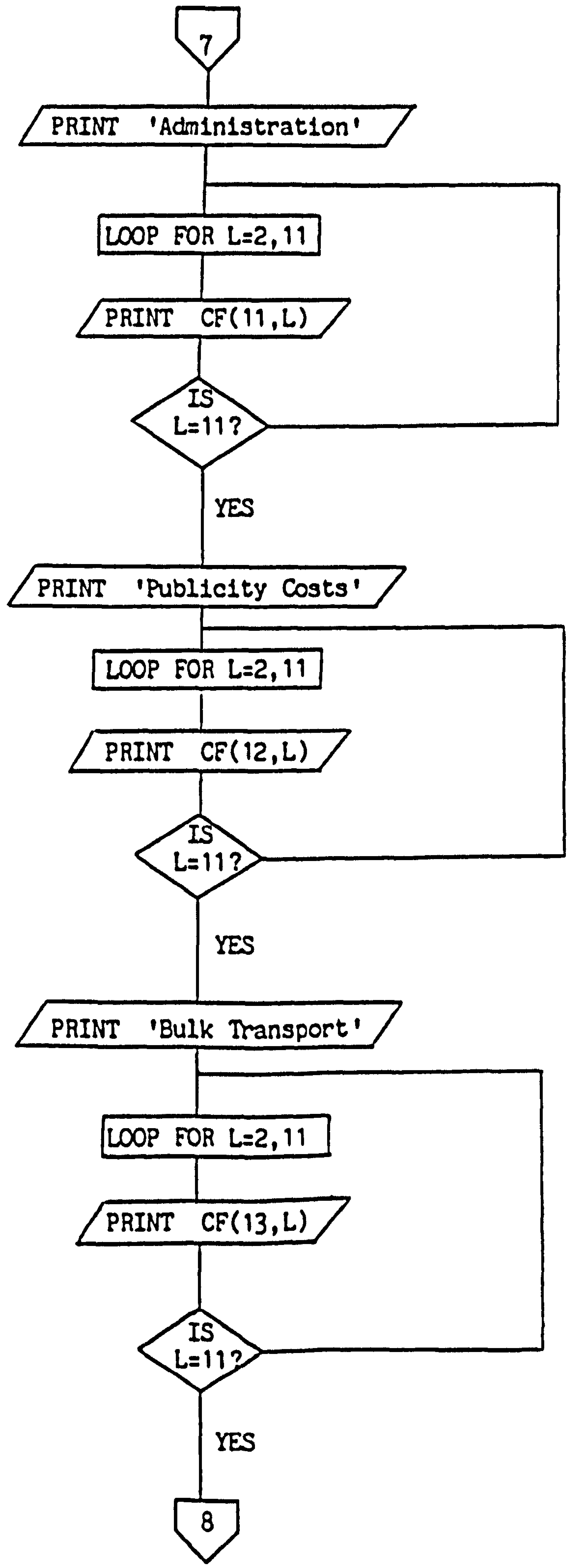

3
DISPOSAL SYSTEMS SURPLUS
CF(24,L)=CF(21,L)+CF(19,L)
CALCULATE DISCOUNT FACTOR INTO CF(25,L)
CF(25,L)=1/(1.0+0.01*DFP)**(L-1)
CALCULATE PRESENT VALUE IN CF(26,L)
CF(26,L)=CF(24,L)*CF(25,L)
IS L=11?
C
YES
INITIALISE SNPV = 0
LOOP FOR L=1,11
CALCULATE NET PRESENT VALUE
SNPV=SNPV+CF(26,L)
IS L=11?
YES
D
LOOP FOR L=1,11
TOTAL SYSTEMS SURPLUS
CF(27,L)=CF(24,L)+CF(25,L)
CALCULATE DISCOUNT FACTOR INTO CF(28,L)
CF(28,L)=1/(1.0+0.01*DFP)**(L-1)
CALCULATE PRESENT VALUE TO CF(26,L)
CF(29,L)=CF(27,L)*CF(28,L)
4

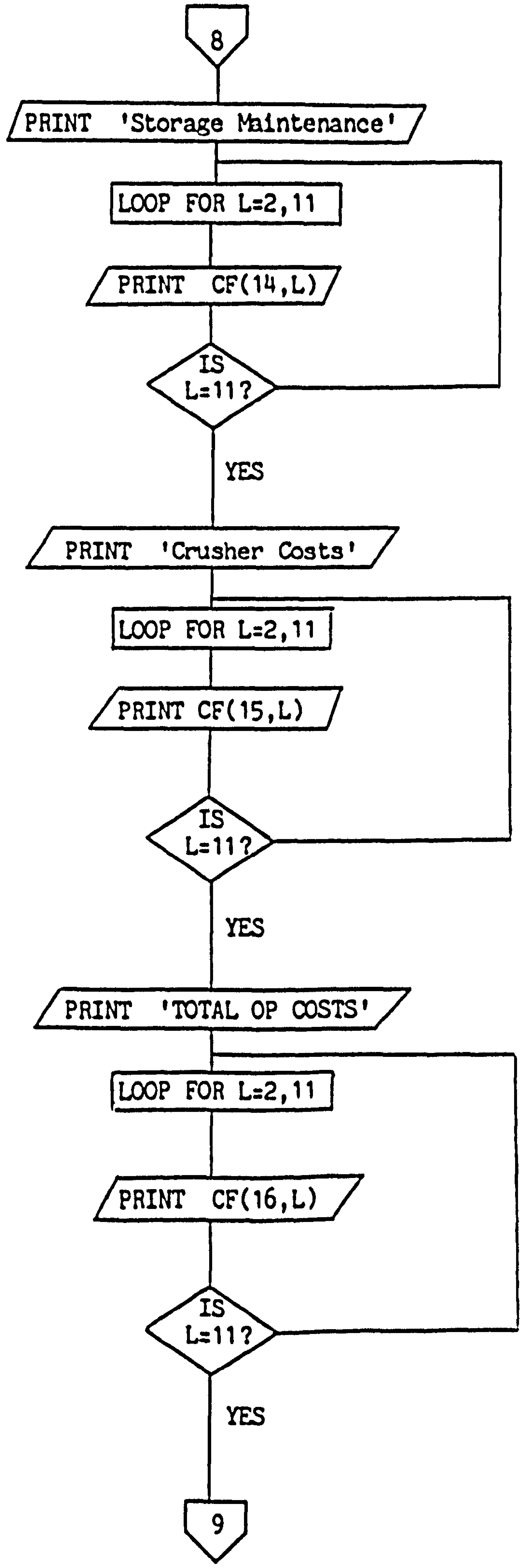

4
IS
L=11?
D
YES
INITIALISE TNPV = 0
LOOP FOR L=1,11
CALCULATE TOTAL NET PRESENT VALUE
TNPV=TNPV+CF(29,L)
IS
L=11?
5

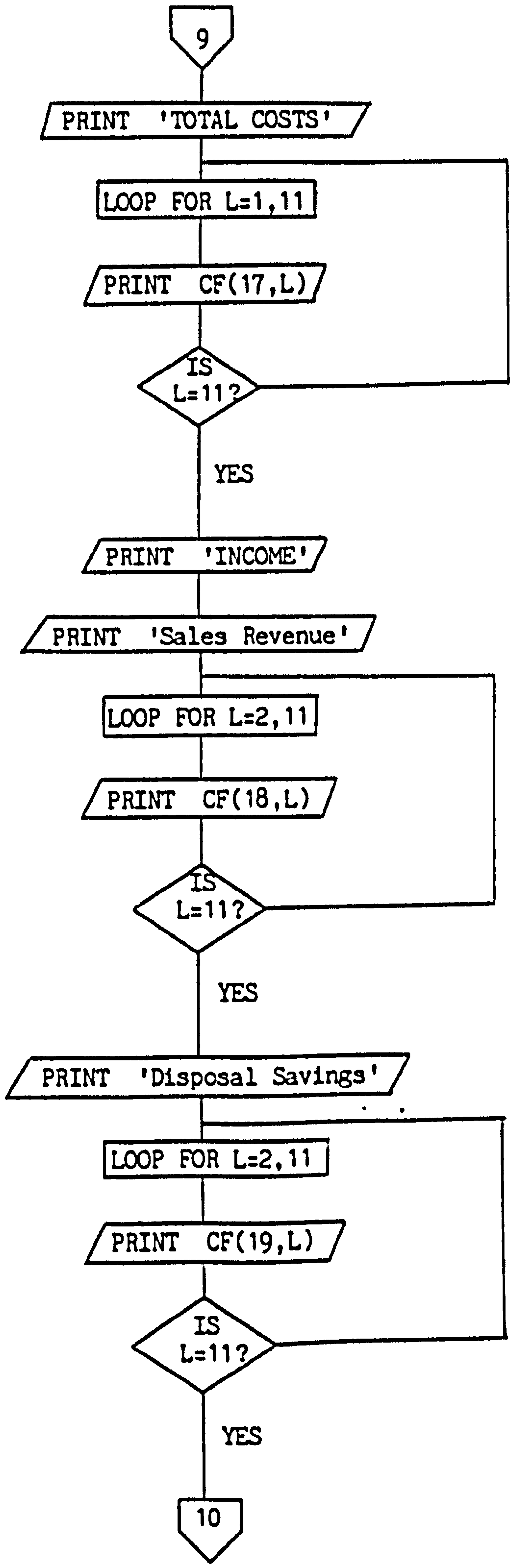
Flow Diagram For Investment Appraisal Of A Glass Recycling Scheme

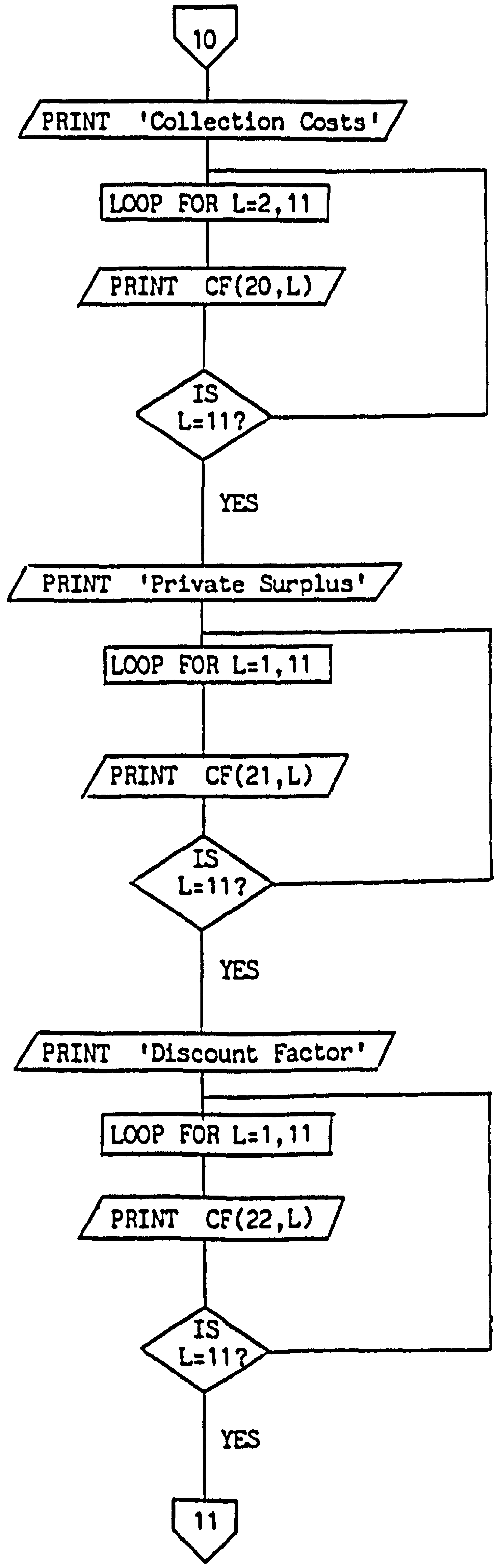


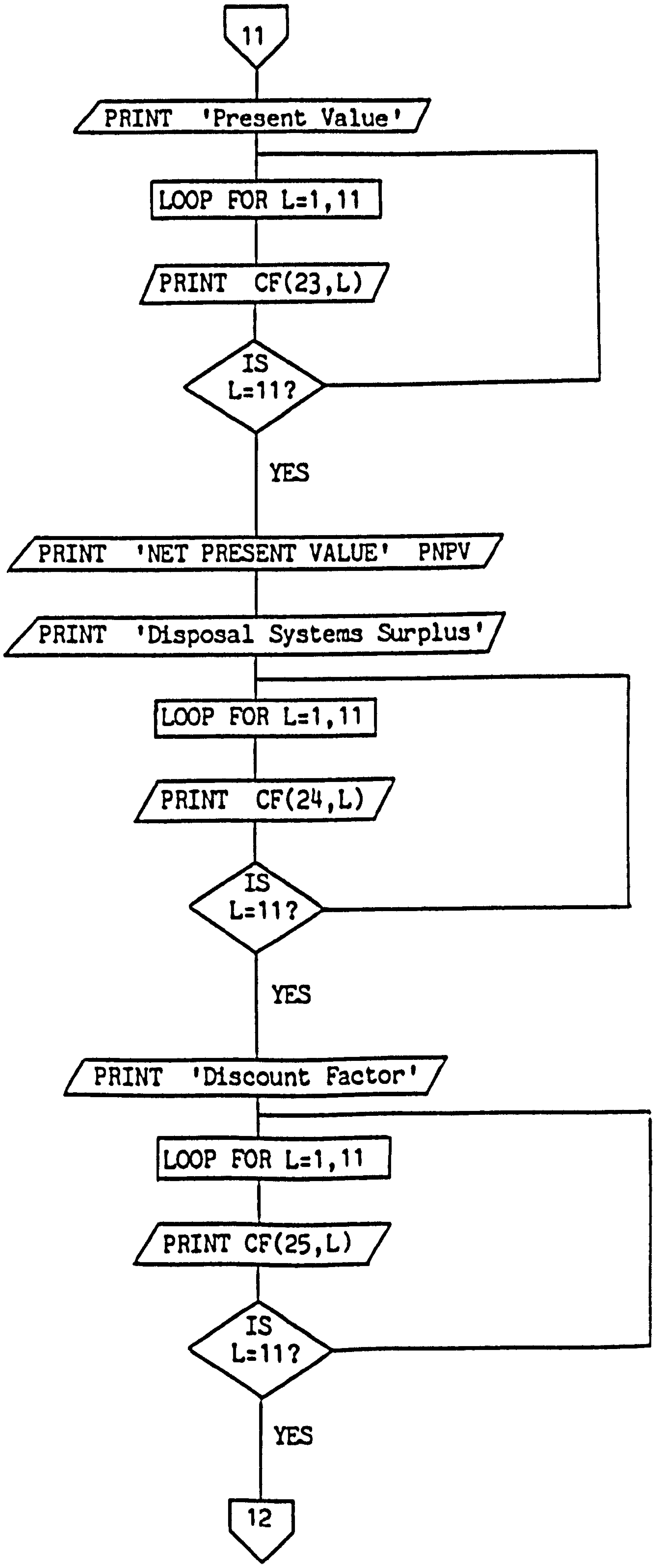

6
PRINT 'OPERATING COSTS'
PRINT 'Collection Costs'
LOOP FOR L=2,11
PRINT CF(8,L)
IS L=11?
YES
PRINT 'Site Maintenance'
LOOP FOR L=2,11
PRINT CF(9,L)
IS L=11?
YES
PRINT 'Skip Maintenance'
LOOP For L=2,11
PRINT CF(10,L)
IS L=11?
YES
7

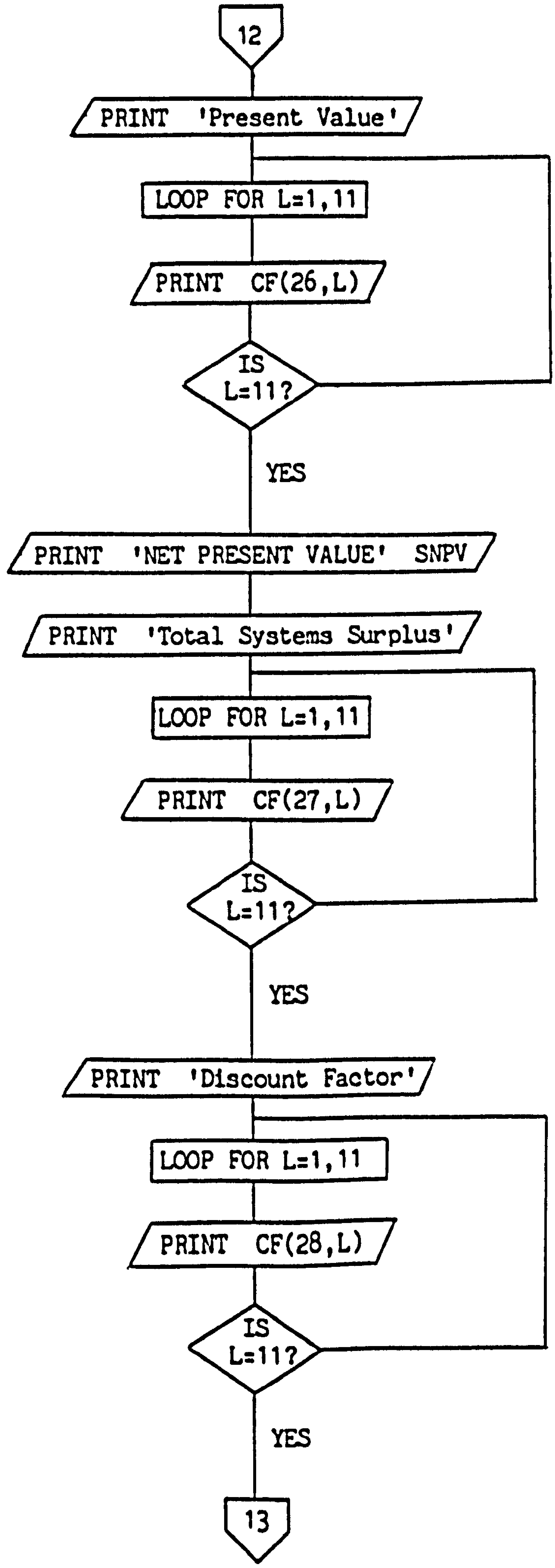

7
PRINT 'Administration'
LOOP FOR L=2,11
PRINT CF(11,L)
IS L=11?
YES
PRINT 'Publicity Costs'
LOOP FOR L=2,11
PRINT CF(12,L)
IS L=11?
YES
PRINT 'Bulk Transport'
LOOP FOR L=2,11
PRINT CF(13,L)
IS L=11?
YES
8

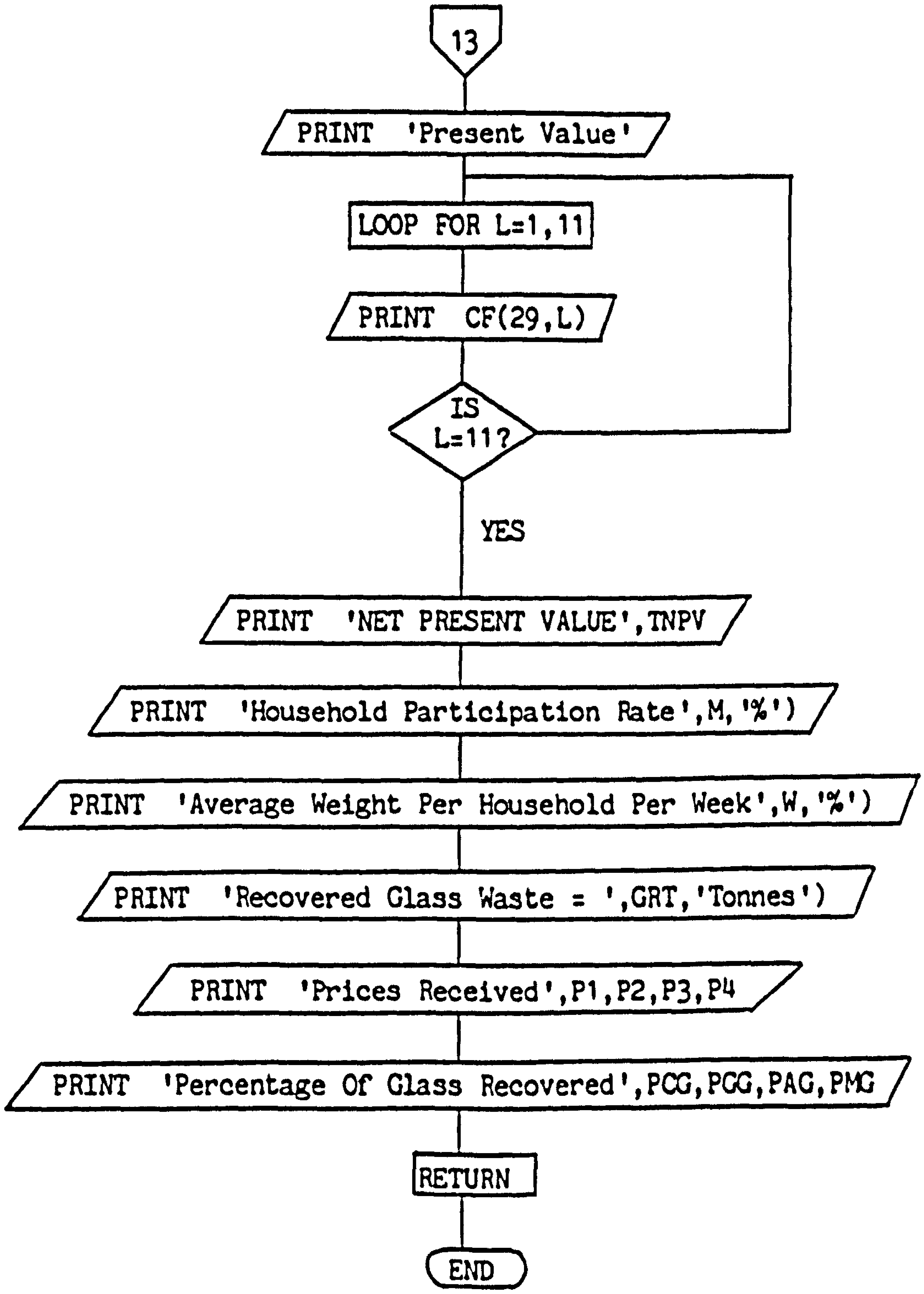

8
PRINT 'Storage Maintenance'
LOOP FOR L=2,11
PRINT CF(14,L)
IS L=11?
YES
PRINT 'Crusher Costs'
LOOP FOR L=2,11
PRINT CF(15,L)
IS L=11?
YES
PRINT 'TOTAL OP COSTS'
LOOP FOR L=2,11
PRINT CF(16,L)
IS L=11?
YES
9


9
PRINT 'TOTAL COSTS'
LOOP FOR L=1,11
PRINT CF(17,L)
IS L=11?
YES
PRINT 'INCOME'
PRINT 'Sales Revenue'
LOOP FOR L=2,11
PRINT CF(18,L)
IS L=11?
YES
PRINT 'Disposal Savings'
LOOP FOR L=2,11
PRINT CF(19,L)
IS L=11?
YES
10


10
PRINT 'Collection Costs'
LOOP FOR L=2,11
PRINT CF(20,L)
IS L=11?
YES
PRINT 'Private Surplus'
LOOP FOR L=1,11
PRINT CF(21,L)
IS L=11?
YES
PRINT 'Discount Factor'
LOOP FOR L=1,11
PRINT CF(22,L)
IS L=11?
YES
11


11
PRINT 'Present Value'
LOOP FOR L=1,11
PRINT CF(23,L)
IS L=11?
YES
PRINT 'NET PRESENT VALUE' PNPV
PRINT 'Disposal Systems Surplus'
LOOP FOR L=1,11
PRINT CF(24,L)
IS L=11?
YES
PRINT 'Discount Factor'
LOOP FOR L=1,11
PRINT CF(25,L)
IS L=11?
YES
12


12
PRINT 'Present Value'
LOOP FOR L=1,11
PRINT CF(26,L)
IS L=11?
YES
PRINT 'NET PRESENT VALUE' SNPV
PRINT 'Total Systems Surplus'
LOOP FOR L=1,11
PRINT CF(27,L)
IS L=11?
YES
PRINT 'Discount Factor'
LOOP FOR L=1,11
PRINT CF(28,L)
IS L=11?
YES
13


13
PRINT 'Present Value'
LOOP FOR L=1,11
PRINT CF(29,L)
IS L=11?
YES
PRINT 'NET PRESENT VALUE',TNPV
PRINT 'Household Participation Rate',M,'%')
PRINT 'Average Weight Per Household Per Week',W,'%')
PRINT 'Recovered Glass Waste = ',GRT,'Tonnes')
PRINT 'Prices Received',P1,P2,P3,P4
PRINT 'Percentage Of Glass Recovered',PCG,PCG,PAG,PMG
RETURN
END

H.1 Data File For Domestic Investment Model

VARIABLE	ID	IP	Y	C	R
VALUE	48837	126978	1.42	19.0	0.0

VARIABLE	N	KC	B	BC	NMD	CMD	NSP	CSP
VALUE	8	746	0	0	0	0	0	0

VARIABLE	KS	RV
VALUE	1040	0

VARIABLE	SKA	TAR	RAI	KL	L	CPR
VALUE	0	0	0	35	8	0

VARIABLE	A	H	E	SKM	TR	TL
VALUE	100	9.47	0.15	80	4.0	0.5

VARIABLE	P1	P2	P3	P4
VALUE	22.0	18.0	18.0	18.0

VARIABLE	PCG	PGG	PAG	PMG
VALUE	0.6	0.0	0.0	0.4

VARIABLE	D
VALUE	3.0

VARIABLE	M	W	DFP
VALUE	20	1	5

Investment Appraisal For A Glass Recovery Scheme
Cash Flows (s)

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
FEASIBILITY STUDY	0.0										
SET UP COSTS											
Site Costs	-280.0										
Skip Costs	-5968.0										
Storage Costs	-1040.0										
Publicity Costs	0.0										
Crusher Costs	0.0										
TOTAL SET UP COSTS	-7288.0										
OPERATING COSTS											
Collection Costs		-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3
Site Maintenance		-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4
Skip Maintenance		-640.0	-640.0	-640.0	-640.0	-640.0	-640.0	-640.0	-640.0	-640.0	-640.0
Administration		-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0
Publicity Costs		-488.4	-488.4	-488.4	-488.4	-488.4	-488.4	-488.4	-488.4	-488.4	-488.4
Bulk Transport		-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6
Storage Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OP COSTS		-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6
TOTAL COSTS	-7288.0	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6
INCOME											
Sales Revenue		10361.3	10361.3	10361.3	10361.3	10361.3	10361.3	10361.3	10361.3	10361.3	10361.3
Disposal Saving		721.2	721.2	721.2	721.2	721.2	721.2	721.2	721.2	721.2	721.2
Collection Savings		9650.2	9650.2	9650.2	9650.2	9650.2	9650.2	9650.2	9650.2	9650.2	9650.2
Private Surplus	-7288.0	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6
Discount At 5.0%	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
Present Value	7288.0	4970.1	4733.5	4508.1	4293.4	4088.9	3894.2	3708.8	3532.2	3364.0	3203.8

Net Present Value = 33208.94

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
Systems Surplus	-7288.0	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9
Discount At 5.0%	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
Present Value	-7288.0	5657.0	5387.6	5131.1	4886.7	4654.0	4432.4	4221.4	4020.3	3828.9	3646.6

Net Present Value = 28578.05

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
Total Surplus	-7288.0	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1
Discount Factor At	1.0000%	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
Present Value	-7288.0	14847.7	14140.6	13467.3	12826.0	12215.2	11633.5	11079.6	10552.0	10045.5	9570.9

Net Present Value = 113034.30

Household Participation Rate = 20 Percent

Investment Appraisal For A Glass Recovery Scheme
Cash Flows (s)

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
FEASIBILITY STUDY	0.0										
SET UP COSTS											
Site Costs	-280.0										
Skip Costs	-5968.0										
Storage Costs	-1040.0										
Publicity Costs	0.0										
Crusher Costs	0.0										
TOTAL SET UP COSTS	-7288.0										
OPERATING COSTS											
Collection Costs		-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3	-1603.3
Site Maintenance		-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4
Skip Maintenance		-640.0	-640.0	-640.0	-640.0	-640.0	-640.0	-640.0	-640.0	-640.0	-640.0
Administration		-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0	-100.0
Publicity Costs		-488.4	-488.4	-488.4	-488.4	-488.4	-488.4	-488.4	-488.4	-488.4	-488.4
Bulk Transport		-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6	-2285.6
Storage Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OP COSTS		-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6
TOTAL COSTS	-7288.0	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6	-5142.6
INCOME											
Sales Revenue		10361.3	10361.3	10361.3	10361.3	10361.3	10361.3	10361.3	10361.3	10361.3	10361.3
Disposal Savings		721.2	721.2	721.2	721.2	721.2	721.2	721.2	721.2	721.2	721.2
Collection Savings		9650.2	9650.2	9650.2	9650.2	9650.2	9650.2	9650.2	9650.2	9650.2	9650.2
Private Surplus	-7288.0	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6	5218.6
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
Present Value	-7288.0	4744.2	4312.9	3920.8	3564.4	3240.4	2945.8	2678.0	2434.5	2213.2	2012.0

Net Present Value = 24778.26

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
Systems Surplus	-7288.0	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9	5939.9
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
Present Value	-7288.0	5399.9	4909.0	4462.7	4057.0	3688.2	3352.9	3048.1	2771.0	2519.1	2290.1

Net Present Value = 29209.87

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
Total Surplus	-7288.0	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1	15590.1
Discount Factor At1.0000%		0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
Present Value	-7288.0	14172.8	12884.3	11713.0	10648.2	9680.2	8800.2	8000.2	7272.5	6611.7	6010.6

Net Present Value = 88506.13

Household Participation Rate = 20 Percent

Average Weight Per Household Per Week = 1.0Kg

Recovered Glass Waste = 507.90 Tonnes

```
INVESTMENT APPRAISAL MODEL FOR A TRADE RECYCLING SCHEME
COMMON /TRI1/ CF(50,20),CT(50,20),CM(50,20)
COMMON /TRI2/ IC,TC,TQ,NV,V,U,FU
COMMON /TRI3/ DW,NL,LC,AC,TM,CLC,CNL
COMMON /TRI4/ TA,TOGP,TB,TD,Y
COMMON /TRI5/ P1,P2,P3,P4,PCG,PGG,PAG,PMG
READ(37,*)IC
READ(37,*)TC,TQ,KS,RV
READ(37,*)NV,V,U,FU
READ(37,*)DW,NL,LC,AC
READ(37,*)TM
READ(37,*)CLC,CNL
READ(37,*)TA
READ(37,*)TOGP
READ(37,*)TR,TL
READ(37,*)TB,TD,Y
READ(37,*)P1,P2,P3,P4
READ(37,*)PCG,PGG,PAG,PMG
READ(37,*)Z,X
READ(37,*)DFP
FEASIBILITY STUDY
FST=FA*FH
TRADE SET UP COSTS
SKIP COSTS
TQ=IC*2
TSK=TC*TQ
STORAGE COSTS
STC=KS+RV
Scheme Meets Full Storage Costs
TSTF=STC
Scheme Shares Storage Costs (TSTC)
TSTC=0.6*STC
Scheme Meets Additional Storage Costs (KTS)
KTS=0
INITIAL PROMOTION COSTS
IPC=PC*IC
CRUSHER COSTS
CUC=U+FU
Scheme Meets Full Crusher Costs
TCUF=CUC
Scheme Shares Crusher Costs (TCUC)
TCUC=0.6*CUC
 Scheme Makes Use Of Existing Facilities
CTC=0
VEHICLE INVESTMENT
VI=NV*V
Scheme Meets Full Costs Of Vehicles (TVIF)
TVIF=VI
Scheme Shares Costs Of Vehicles (TVI)
TVI=0.2*VI
Scheme Uses Existing Vehicles (TVIM)
(Extra Fuel Costs)
TVIM=0
TOTAL TRADE SET UP COSTS
TRADE SYSTEM MEETS FULL SET UP COSTS (TFSUC)
TFSUC=TSK+TSTF+IPC+TCUF+TVIF
TRADE SYSTEM SHARES SET UP COSTS (TTSUC)
TTSUC=TSK+TSTC+IPC+TCUC+TVI
TRADE SYSTEM MEETS EXTRA SET UP COSTS (TMSUC)
TMSUC=TSK+TKS+IPC+CTC+TVIM
```

```
C
C       GROSS TONNAGE RECOVERED (TRT)
        TRT=0.05*(0.01*Z*(X*IC))
C       OPERATING COSTS
C       COLLECTION COSTS
C       LABOUR COSTS
C       Scheme Meets Full Costs Of Labour
        TLAB=50*(DW+NL*LC)*(1+0.01*AC)
C       Scheme Shares Costs Of Labour (TTLB)
        TTLB=0.2*TLAB
C       Scheme meets Additional Costs Of Labour (TMLB)
        TMLB=0
C       VEHICLE OPERATING COSTS
C       Scheme Meets Full Vehicle Costs (TV)
        TV=NV*50*TM
C       Scheme Shares Vehicle Costs (TTV)
        TTV=0.2*TV
C       Scheme Meets Extra Vehicle Cosas (TMTV)
C       (E.g. Fuel Costs)
C       SKIP MAINTENANCE
        TSKM=TQ*TKM
C       ADMINISTRATION COSTS
        TA=TH*TW
C       ONGOING PROMOTION
        TPUB=IC*PB
C       CRUSHER OPERATING COSTS
        COC=50*(CLC+CNL)*(1+0.01*AC)
C       Scheme Meets Full Crusher Costs (CLAB)
        CLAB=COC
C       Scheme Shares Crusher Costs (TCLB)
        TCLB=0.2*CLAB
C       Scheme Meets Extra Crusher Costs (TCMB)
C       FUEL COSTS
        TCMB=0
C       CRUSHER SUPPLIES & SERVICES
        CSS=CSPT*0.05*(0.01*Z*(X*IC))
C       Scheme Meets Full Cossts Of Supplies & Services
        CSC=CSS
C       Scheme Shares Supply Costs (TCSC)
        TCSC=0.2*CSS
C       Scheme Meets Extra Costs Of Supplies (TCMC)
        TCMC=0
C       STORAGE MAINTENANCE
        TSTM=SM*SH
C       BULK TRANNSPORT OF TRADE GLASS
        TBTR=(TR+TL)*TRT
C
C       TOTAL TRADE OPERATING COSTS
C       TOTAL TRADE OPERATING COSTS MEETING FULL COSTS (TFOPC)
        TFOPC=TLAB+TV+TSKM+TA+TPUB+CLAB+CSC+TSTM+TBTR
C       TOTAL OPERATING COSTS (SHARING COSTS) (TTOPC)
        TTOPC=TTLB+TTV+TSKM+TA+TPUB+TCLB+TCSC+TSTM+TBTR
C       TOTAL TRADE OPERATINNG COSTS (MEETS EXTRA COSTS) (TMOPC)
        TMOPC=TMLB+TMTV+TSKM+TA+TPUB+TCMB+TCMC+TSTM+TBTR
C
C
C       INCOME
C        SALES REVENUE
      TTP1=P1*PCG*TRT
      TTP2=P2*PGG*TRT
```

```
      TTP3=P3*PAG*TRT
      TTP4=P4*PMG*TRT
      TTRA=TTP1+TTP2+TTP3+TTP4
C
C     DISPOSAL SAVINGS (TRDS)
      TRDS=Y*TRT
C
C     CHANGES IN COLLECTION COSTS (TCH)
C     Loss In Trade Revenue (LTR)
      LTR=TB*TRT
C     Savings In Collection Costs (SCC)
      SCC=TD*TRT
C     Net Change In Collection Costs (TCH)
      TCH=SCC-LTR
C     SUBROUTINE CASHFLOW
C     CALCULATE CASH FLOWS AND TABULATE THEM
C     TRADE SET UP COSTS (Meets Full Costs)
      CF(1,1)=TSK*(-1)
      CF(2,1)=TSTF*(-1)
      CF(3,1)=IPC*(-1)
      CF(4,1)=TCUF*(-1)
      CF(5,1)=TVIF*(-1)
C     TOTAL SET UP COSTS (Full Costs)
      DO 10 J=1,11
      CF(6,J)=CF(1,J)+CF(2,J)+CF(3,J)+CF(4,J)+CF(5,J)
 10   CONTINUE
C
C     OPERATING COSTS (Full Costs)
      DO 20 J=2,11
      CF(7,J)=TLAB*(-1)
      CF(8,J)=TV*(-1)
      CF(9,J)=TSKM*(-1)
      CF(10,J)=TA*(-1)
      CF(11,J)=TPUB*(-1)
      CF(12,J)=CLAB*(-1)
      CF(13,J)=CSC*(-1)
      CF(14,J)=TSTM*(-1)
      CF(15,J)=TBTR*(-1)
 20   CONTINUE
C     SUM OF TRADE OPERATING COSTS (Full Costs)
      DO 30 J=2,11
      CF(16,J)=CF(7,J)+CF(8,J)+CF(9,J)+CF(10,J)+CF(11,J)+CF(12,J)
     C+CF(13,J)+CF(14,J)+CF(15,J)
 30   CONTINUE
C     TOTAL COSTS (Full Costs)
      DO 40 J=1,11
      CF(17,J)=CF(6,J)+CF(16,J)
 40   CONTINUE
C
C      INCOME
      DO 50 J=2,11
      CF(18,J)=TTRA
      CF(19,J)=TRDS
      CF(20,J)=LTR
      CF(21,J)=SCC
      CF(22,J)=TCH
 50   CONTINUE
C     CALCULATE NET EFFECTS (Profit,Loss)
C     PRIVATE VIABILITY (Full Costs)
      DO 60 J=1,11
```

```
      CF(23,J)=CF(18,J)+CF(17,J)
      CF(24,J)=1/(1.0+0.01*DFP)**(J-1)
      CF(25,J)=CF(23,J)*CF(24,J)
60    CONTINUE
      PNPV=0
      DO 70 J=1,11
      PNPV=PNPV+CF(25,J)
70    CONTINUE
C     DISPOSAL SYSTEMS SURPLUS (Full Costs)
      DO 80 J=1,11
      CF(26,J)=CF(23,J)+CF(19,J)
      CF(27,J)=1/(1.0+0.01*DFP)**(J-1)
      CF(28,J)=CF(26,J)*CF(27,J)
80    CONTINUE
      SNPV=0
      DO 90 J=1,11
      SNPV=SNPV+CF(28,J)
90    CONTINUE
C     TOTAL SYSTEMS SURPLUS (Full Costs)
      DO 100 J=1,11
      CF(29,J)=CF(26,J)+CF(22,J)
      CF(30,J)=1/(1.0+0.01*DFP)**(J-1)
      CF(31,J)=CF(29,J)*CF(30,J)
100   CONTINUE
      TNPV=0
      DO 110 J=1,11
      TNPV=TNPV+CF(31,J)
110   CONTINUE
C     PRINT CASH FLOWS TABLE AND NET PRESENT VALUE
C     FOR TRADE OPERATING SYSTEM (Meeting Full Costs)
      WRITE(32,200)
200   FORMAT('0','Investment Appraisal For Trade Recovery Scheme')
      WRITE(32,210)
210   FORMAT(' ','Cash Flows ( ₤s)')
      WRITE(32,220)(J,J=0,10)
220   FORMAT('0',22X,11('YEAR',I2,3X))
      WRITE(32,225)FST
225   FORMAT('0','FEASIBILITY STUDY',3X,F7.1)
      WRITE(32,230)
230   FORMAT('0','TRADE SET UP COSTS')
      WRITE(32,240)CF(1,1)
240   FORMAT(' ',2X,'Skip Costs',10X,F7.1)
      WRITE(32,250)CF(2,1)
250   FORMAT(' ',2X,'Storage Costs',7X,F7.1)
      WRITE(32,260)CF(3,1)
260   FORMAT(' ',2X,'Promotion Costs',5X,F7.1)
      WRITE(32,270)CF(4,1)
270   FORMAT(' ',2X,'Crusher Costs',7X,F7.1)
      WRITE(32,280)CF(5,1)
280   FORMAT(' ',2X,'Vehicle Costs',4X,F10.1)
      WRITE(32,290)CF(6,1)
290   FORMAT(' ',2X,'TOTAL SET UP COSTS',F10.1)
C     OPERATING COSTS
      WRITE(32,300)
300   FORMAT('0','OPERATING COSTS')
      WRITE(32,310)(CF(7,J),J=2,11)
310   FORMAT(' ',2X,'Labour Costs',16X,10(F8.1,1X))
      WRITE(32,320)(CF(8,J),J=2,11)
320   FORMAT(' ',2X,'Vehicle Costs',15X,10(F8.1,1X))
      WRITE(32,330)(CF(9,J),J=2,11)
```

```
330    FORMAT(' ',2X,'Skip Maintenance',12X,10(F8.1,1X))
       WRITE(32,340)(CF(10,J),J=2,11)
340    FORMAT(' ',2X,'Administration',14X,10(F8.1,1X))
       WRITE(32,350)(CF(11,J),J=2,11)
350    FORMAT(' ',2X,'Promotional Costs',11X,10(F8.1,1X))
       WRITE(32,360)(CF(12,J),J=2,11)
360    FORMAT(' ',2X,'Crusher Costs',15X,10(F8.1,1X))
       WRITE(32,370)(CF(13,J),J=2,11)
370    FORMAT(' ',2X,'Crusher Supplies',12X,10(F8.1,1X))
       WRITE(32,380)(CF(14,J),J=2,11)
380    FORMAT(' ',2X,'Storage Maintenance',9X,10(F8.1))
       WRITE(32,390)(CF(15,J),J=2,11)
390    FORMAT(' ',2X,'Bulk Transport',14X,10(F8.1,1X))
       WRITE(32,400)(CF(16,J),J=2,11)
400    FORMAT(' ','TOTAL OP COSTS',16X,10(F8.1,1X))
       WRITE(32,410)(CF(17,J),J=1,11)
410    FORMAT('0','TOTAL COSTS',10X,11(F8.1,1X))
       WRITE(32,420)
420    FORMAT('0','INCOME')
       WRITE(32,430)(CF(18,J),J=2,11)
430    FORMAT(' ',2X,'Sales Revenue',15X,10(F8.1,1X))
       WRITE(32,440)(CF(19,J),J=2,11)
440    FORMAT(' ',2X,'Disposal Savings',12X,10(F8.1,1X))
       WRITE(32,450)(CF(20,J),J=2,11)
450    FORMAT(' ',2X,'Trade Revenue',15X,10(F8.1,1X))
       WRITE(32,460)(CF(21,J),J=2,11)
460    FORMAT(' ',2X,'Collection Savings',10X,10(F8.1,1X))
       WRITE(32,470)(CF(22,J),J=2,11)
470    FORMAT(' ',2X,'Collection Changes',10X,10(F8.1,1X))
       WRITE(32,480)(CF(23,J),J=1,11)
480    FORMAT('0','PRIVATE SURPLUS',6X,11(F8.1,1X))
       WRITE(32,490)DFP
490    FORMAT(' ','Discount At',F5.1,'%')
       WRITE(32,500)(CF(24,J),J=1,11)
500    FORMAT('+',20X,11(F8.3,1X))
       WRITE(32,510)(CF(25,J),J=1,11)
510    FORMAT('0','PRESENT VALUE',8X,11(F8.1,1X))
       WRITE(32,520)PNPV
520    FORMAT('0','NET PRESENT VALUE = ',F10.2)
       WRITE(32,530)
530    FORMAT('0','  ')
       WRITE(32,550)(CF(26,J),J=1,11)
550    FORMAT('0','SYSTEMS SURPLUS',6X,11(F8.1,1X))
       WRITE(32,560)DFP
560    FORMAT(' ','Discount At',F5.1,'%')
       WRITE(32,570)(CF(27,J),J=1,11)
570    FORMAT('+',20X,11(F8.3,1X))
       WRITE(32,580)(CF(28,J),J=1,11)
580    FORMAT(' ','Present Value',7X,11(F8.1,1X))
       WRITE(32,590)SNPV
590    FORMAT('1','Net Present Value = ',F12.2)
       WRITE(32,600)
600    FORMAT('0','')
       WRITE(32,610)(CF(29,J),J=1,11)
610    FORMAT('0','TOTAL SURPLUS',8X,11(F8.1,1X))
       WRITE(32,620)DFP
620    FORMAT(' ','Discount At',F5.1)
       WRITE(32,630)(CF(30,J),J=1,11)
630    FORMAT('+',20X,11(F8.3,1X))
       WRITE(32,640)(CF(31,J),J=1,11)
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  640   FORMAT('-','PRESENT VALUE',8X,11(F8.1,1X))
        WRITE(32,650)TNPV
  650   FORMAT(' ','NET PRESENT VALUE = ',F12.2)
C
C       SUBROUTINE CASHFLOW
C       CALCULATE CASH FLOWS AND TABULATE THEM
C       SHARES OPERATING COSTS
C       TRADE SET UP COSTS (Shares Costs)
C
        CT(1,1)=TSK*(-1)
        CT(2,1)=TSTC*(-1)
        CT(3,1)=IPC*(-1)
        CT(4,1)=TCUC*(-1)
        CT(5,1)=TVI*(-1)
C       TOTAL TRADE SET UP COSTS (shares Costs)
        DO 12 K=1,11
        CT(6,K)=CT(1,K)+CT(2,K)+CT(3,K)+CT(4,K)+CT(5,K)
   12   CONTINUE
C       OPERATING COSTS (Shares Costs)
        DO 22 K=2,11
        CT(7,K)=TTLB*(-1)
        CT(8,K)=TTV*(-1)
        CT(9,K)=TSKM*(-1)
        CT(10,K)=TA*(-1)
        CT(11,K)=TPUB*(-1)
        CT(12,K)=TCLB*(-1)
        CT(13,K)=TCSC*(-1)
        CT(14,K)=TSTM*(-1)
        CT(15,K)=TBTR*(-1)
   22   CONTINUE
C       SUM OF OPERATING COSTS (Shares Costs)
        DO 32 K=2,11
        CT(16,K)=CT(7,K)+CT(8,K)+CT(9,K)+CT(10,K)+CT(11,K)+CT(12,K)
     C  +CT(13,K)+CT(14,K)+CT(15,K)
   32   CONTINUE
C       TOTAL COSTS
        DO 42 K=1,11
        CT(17,K)=CT(6,K)+CT(16,K)
   42   CONTINUE
C
C       INCOME
        DO 52 K=2,11
        CT(18,K)=TTRA
        CT(19,K)=TRDS
        CT(20,K)=LTR
        CT(21,K)=SCT
        CT(22,K)=TCH
   52   CONTINUE
C       CALCULATE NET EFFECTS (Profit.Loss)
C       Private Viability
        DO 62 K=1,11
        CT(23,K)=CT(18,K)+CT(17,K)
        CT(24,K)=1/(1.0+0.01*DFP)**(K-1)
        CT(25,K)=CT(23,K)*CT(24,K)
   62   CONTINUE
        PNPV=0
        DO 72 K=1,11
        PNPV=PNPV+CT(25,K)
   72   CONTINUE
C       DISPOSAL SYSTEMS SURPLUS
```

```
      DO 82 K=1,11
      CT(26,K)=CT(23,K)+CT(19,K)
      CT(27,K)=1/(1.0+0.01*DFP)**(K-1)
      CT(28,K)=CT(26,K)*CT(27,K)
   82 CONTINUE
      SNPV=0
      DO 92 K=1,11
      SNPV=SNPV+CT(28,K)
   92 CONTINUE
C     TOTAL SYSTEMS SURPLUS (Shares Costs)
      DO 102 K=1,11
      CT(29,K)=CT(26,K)+CT(22,K)
      CT(30,K)=1/(1.0+0.01*DFP)**(K-1)
      CT(31,K)=CT(29,K)*CT(30,K)
  102 CONTINUE
      TNPV=0
      DO 112 K=1,11
      TNPV=TNPV+CT(31,K)
  112 CONTINUE
C     TRADE OPERATING SYSTEM (shares Costs)
      WRITE(32,700)
  700 FORMAT('0','INVESTMENT APPRAISAL FOR TRADE RECOVERY SCHEME')
      WRITE(32,710)
  710 FORMAT('0','SHARES COSTS')
      WRITE(32,715)
  715 FORMAT(' ',10X,'Cash Flows (  s)')
      WRITE(32,720) (K,K=0,10)
  720 FORMAT('0',22X,11('YEAR',I2,3X))
      WRITE(32,725)
  725 FORMAT('0','TRADE SET UP COSTS (Shares Costs)')
      WRITE(32,730)CT(1,1)
  730 FORMAT(' ',2X,'Skip Costs',9X,F7.1)
      WRITE(32,735)CT(2,1)
  735 FORMAT(' ',2X,'Storage Costs',8X,F7.1)
      WRITE(32,740)CT(3,1)
  740 FORMAT(' ',2X,'Promotion Costs',4X,F7.1)
      WRITE(32,745)CT(4,1)
  745 FORMAT(' ',2X,'Crusher Costs',6X,F7.1)
      WRITE(32,750)CT(5,1)
  750 FORMAT(' ',2X,'Vehicle Costs',4X,F10.2)
      WRITE(32,760)CT(6,1)
  760 FORMAT('0','TOTAL SET UP COSTS',F10.1)
C     TRADE OPERATING COSTS (Shares Costs)
      WRITE(32,770)
  770 FORMAT('0','Trade Operating Costs')
      WRITE(32,780) (CT(7,K),K=2,11)
  780 FORMAT(' ',2X,'Labour Costs',14X,10(F8.1,1X))
      WRITE(32,790) (CT(8,K),K=2,11)
  790 FORMAT(' ',2X,'Vehicle Costs',13X,10(F8.1,1X))
      WRITE(32,800) (CT(9,K),K=2,11)
  800 FORMAT(' ',2X,'Skip Maintenance',10X,10(F8.1,1X))
      WRITE(32,810) (CT(10,K),K=2,11)
  810 FORMAT(' ',2X,'Administration',12X,10(F8.1,1X))
      WRITE(32,820) (CT(11,K),K=2,11)
  820 FORMAT(' ',2X,'Promotional Costs',9X,10(F8.1,1X))
      WRITE(32,830) (CT(12,K),K=2,11)
  830 FORMAT(' ',2X,'Crusher Costs',13X,10(F8.1,1X))
      WRITE(32,840) (CT(13,K),K=2,11)
  840 FORMAT(' ',2X,'Crusher Supplies',10X,10(F8.1,1X))
      WRITE(32,850) (CT(14,K),K=2,11)
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  850   FORMAT(' ',2X,'Storage Maintenance',7X,10(F8.1,1X))
        WRITE(32,860)(CT(15,K),K=2,11)
  860   FORMAT(' ',2X,'Bulk Transport',12X,10(F8.1,1X))
        WRITE(32,870)(CT(16,K),K=2,11)
  870   FORMAT('0','TOTAL OP COSTS',14X,10(F8.1,1X))
        WRITE(32,880)(CT(17,K),K=1,11)
  880   FORMAT('0','TOTAL COSTS',14X,11(F8.1,1X))
        WRITE(32,890)
  890   FORMAT('0','INCOME')
        WRITE(32,900)(CT(18,K),K=2,11)
  900   FORMAT('0',2X,'Sales Revenue',13X,10(F8.1,1X))
        WRITE(32,910)(CT(19,K),K=2,11)
  910   FORMAT(' ',2X,'Disposal Savings',10X,10(F8.1,1X))
        WRITE(32,920)(CT(20,K),K=2,11)
  920   FORMAT(' ',2X,'Trade Revenue',13X,10(F8.1,1X))
        WRITE(32,930)(CT(21,K),K=2,11)
  930   FORMAT(' ',2X,'Collection Savings',8X,10(F8.1,1X))
        WRITE(32,940)(CT(22,K),K=2,11)
  940   FORMAT(' ',2X,'Trade C Changes',11X,10(F8.1,1X))
        WRITE(32,950)(CF(23,K),K=1,11)
  950   FORMAT('0','PRIVATE SURPLUS',5X,11(F8.1,1X))
        WRITE(32,960)DFP
  960   FORMAT(' ','Discount At',F5.1,'%')
        WRITE(32,970)(CT(24,K),K=1,11)
  970   FORMAT('+',20X,11(F8.3,1X))
        WRITE(32,980)(CT(25,K),K=1,11)
  980   FORMAT('0','PRESENT VALUE',7X,11(F8.1,1X))
        WRITE(32,990)PNPV
  990   FORMAT('0','NET PRESENT VALUE =',F12.2)
        WRITE(32,1000)
 1000   FORMAT('0','   ')
        WRITE(32,1010)(CT(26,K),K=1,11)
 1010   FORMAT('0','SYSTEMS SURPLUS',5X,11(F8.1,1X))
        WRITE(32,1020)DFP
 1020   FORMAT(' ','Discount At',F5.1,'%')
        WRITE(32,1030)(CT(27,K),K=1,11)
 1030   FORMAT('+',20X,11(F8.3,1X))
        WRITE(32,1040)(CT(28,K),K=1,11)
 1040   FORMAT(' ','Present Value',7X,11(F8.1,1X))
        WRITE(32,1050)SNPV
 1050   FORMAT(' ','Net Present Value = ',F12.2)
        WRITE(32,1060)
 1060   FORMAT('0','   ')
        WRITE(32,1070)(CT(29,K),K=1,11)
 1070   FORMAT('0','TOTAL SURPLUS',7X,11(F8.1,1X))
        WRITE(32,1080)DFP
 1080   FORMAT(' ','Discount At',F5.1,'%')
        WRITE(32,1090)(CT(30,K),K=1,11)
 1090   FORMAT('+',20X,11(F8.3,1X))
        WRITE(32,1100)(CT(31,K),K=1,11)
 1100   FORMAT(' ','Present Value',7X,11(F8.1,1X))
        WRITE(32,1110)TNPV
 1110   FORMAT(' ','Net Present Value = ',F12.2)
        WRITE(32,1150)
 1150   FORMAT('0','   ')
C       SUBROUTINE CASHFLOW
C       TRADE SET UP COSTS (Meets Extra Costs)
        CM(1,1)=TSK*(-1)
        CM(2,1)=KTS*(-1)
        CM(3,1)=IPC*(-1)
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```
      CM(4,1)=CTC*(-1)
      CM(5,1)=TVIM*(-1)
C     TOTAL SET UP COSTS (Meets Extra CostsO
      DO 14 L=1,11
      CM(6,L)=CM(1,L)+CM(2,L)+CM(3,L)+CM(4,L)+CM(5,L)
14    CONTINUE
C     OPERATING COSTS (Meets Extra Costs)
      DO 24 L=2,11
      CM(7,L)=TMLB*(-1)
      CM(8,L)=TMTV*(-1)
      CM(9,L)=TSKM*(-1)
      CM(10,L)=TA*(-1)
      CM(11,L)=TPUB*(-1)
      CM(12,L)=TCMB*(-1)
      CM(13,L)=TCMC*(-1)
      CM(14,L)=TSTM*(-1)
      CM(15,L)=TBTR*(-1)
24    CONTINUE
C     SUM OF TRADE OPERATING COSTS (Meets Full Costs)
      DO 34 L=2,11
      CM(16,L)=CM(7,L)+CM(8,L)+CM(9,L)+CM(10,L)+CM(11,L)+CM(12,L)
     C +CM(13,L)+CM(14,L)+CM(15,L)
34    CONTINUE
C     TOTAL COSTS (Meets Extra Costs)
      DO 44 L=1,11
      CM(17,L)=CM(6,L)+CM(16,L)
44    CONTINUE
C     INCOME
      DO 54 L=2,11
      CM(18,L)=TTRA
      CM(19,L)=TRDS
      CM(20,L)=LTR
      CM(21,L)=SCC
      CM(22,L)=TCH
54    CONTINUE
C     CALCULATE NET EFFECTS (Profit\Loss)
C     PRIVATE VIABILITY (Meets Extra Costs)
      DO 64 L=1,11
      CM(23,L)=CM(18,L)+CM(17,L)
      CM(24,L)=1/(1.0+0.01*DFP)**(L-1)
      CM(25,L)=CM(23,L)*CM(24,L)
64    CONTINUE
      PNPV=0
      DO 74 L=1,11
      PNPV=PNPV+CM(25,L)
74    CONTINUE
C     DISPOSAL SYSTEMS SURPLUS (Meets Extra Costs)
      DO 84 L=1,11
      CM(26,L)=CM(23,L)+CM(19,L)
      CM(27,L)=1/(1.0+0.01*DFP)**(L-1)
      CM(28,L)=CM(26,L)*CM(27,L)
84    CONTINUE
      SNPV=0
      DO 94 L=1,11
      SNPV=SNPV+CM(28,L)
94    CONTINUE
C     TOTAL SYSTEMS SURPLUS (Meets Extra Costs)
      DO 104 L=1,11
      CM(29,L)=CM(26,L)+CM(22,L)
      CM(30,L)=1/(1.0+0.01*DFP)**(L-1)
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      CM(31,L)=CM(29,L)*CM(30,L)
  104 CONTINUE
      TNPV=0
      DO 114 L=1,11
      TNPV=TNPV+CM(31,L)
  114 CONTINUE
C     PRINT CASH FLOWS TABLE AND NET PRESENT VALUES
C     FOR TRADE OPERATING SYSTEM (Meeting Extra Costs)
      WRITE(32,1500)
 1500 FORMAT('0','Investment Appraisal Model For Trade Glass ')
      WRITE(32,1600)
 1600 FORMAT('0','Scheme Meets Extra Costs')
      WRITE(32,1700)
 1700 FORMAT('0',10X,'Cash Flows (  s)')
      WRITE(32,1800)(L,L=0,10)
 1800 FORMAT('0',25X,11('YEAR',I2,3X))
      WRITE(32,1900)
 1900 FORMAT('0','TRADE SET UP COSTS')
      WRITE(32,2000)CM(1,1)
 2000 FORMAT(' ',2X,'Skip Costs',12X,F7.1)
      WRITE(32,2100)CM(2,1)
 2100 FORMAT(' ',2X,'Storage Costs',9X,F7.1)
      WRITE(32,2200)CM(3,1)
 2200 FORMAT(' ',2X,'Promotion Costs',7X,F7.1)
      WRITE(32,2300)CM(4,1)
 2300 FORMAT(' ',2X,'Crusher Costs',9X,F7.1)
      WRITE(32,2400)CM(5,1)
 2400 FORMAT(' ',2X,'Vehicle Costs',6X,F10.1)
      WRITE(32,2500)CM(6,1)
 2500 FORMAT(' ','TOTAL SET UP COSTS',3X,F10.1)
C     OPERATING COSTS
      WRITE(32,2600)(CM(7,L),L=2,11)
 2600 FORMAT(' ',2X,'Labour Costs',17X,10(F8.1,1X))
      WRITE(32,2700)(CM(8,L),L=2,11)
 2700 FORMAT(' ',2X,'Vehicle Costs',16X,10(F8.1,1X))
      WRITE(32,2800)(CM(9,L),L=2,11)
 2800 FORMAT(' ',2X,'Skip Maintenance',13X,10(F8.1,1X))
      WRITE(32,2900)(CM(10,L),L=2,11)
 2900 FORMAT(' ',2X,'Administration',15X,10(F8.1,1X))
      WRITE(32,3000)(CM(11,L),L=2,11)
 3000 FORMAT(' ',2X,'Promotional Costs',12X,10(F8.1,1X))
      WRITE(32,3100)(CM(12,L),L=2,11)
 3100 FORMAT(' ',2X,'Crusher Costs',16X,10(F8.1,1X))
      WRITE(32,3200)(CM(13,L),L=2,11)
 3200 FORMAT(' ',2X,'Crusher Supplies',13X,10(F8.1,1X))
      WRITE(32,3300)(CM(14,L),L=2,11)
 3300 FORMAT(' ',2X,'Storage Maintenance',10X,10(F8.1,1X))
      WRITE(32,3400)(CM(15,L),L=2,11)
 3400 FORMAT(' ',2X,'Bulk Transport',15X,10(F8.1,1X))
      WRITE(32,3500)(CM(16,L),L=2,11)
 3500 FORMAT(' ','TOTAL OP COSTS',17X,10(F8.1,1X))
      WRITE(32,3600)(CM(17,L),L=1,11)
 3600 FORMAT('0','TOTAL COSTS',12X,11(F8.1,1X))
      WRITE(32,3700)
 3700 FORMAT('0','INCOME')
      WRITE(32,3800)(CM(18,L),L=2,11)
 3800 FORMAT(' ',2X,'Sales Revenue',16X,10(F8.1,1X))
      WRITE(32,3900)(CM(19,L),L=2,11)
 3900 FORMAT(' ',2X,'Disposal Savings',13X,10(F8.1,1X))
      WRITE(32,4000)(CM(20,L),L=2,11)
```
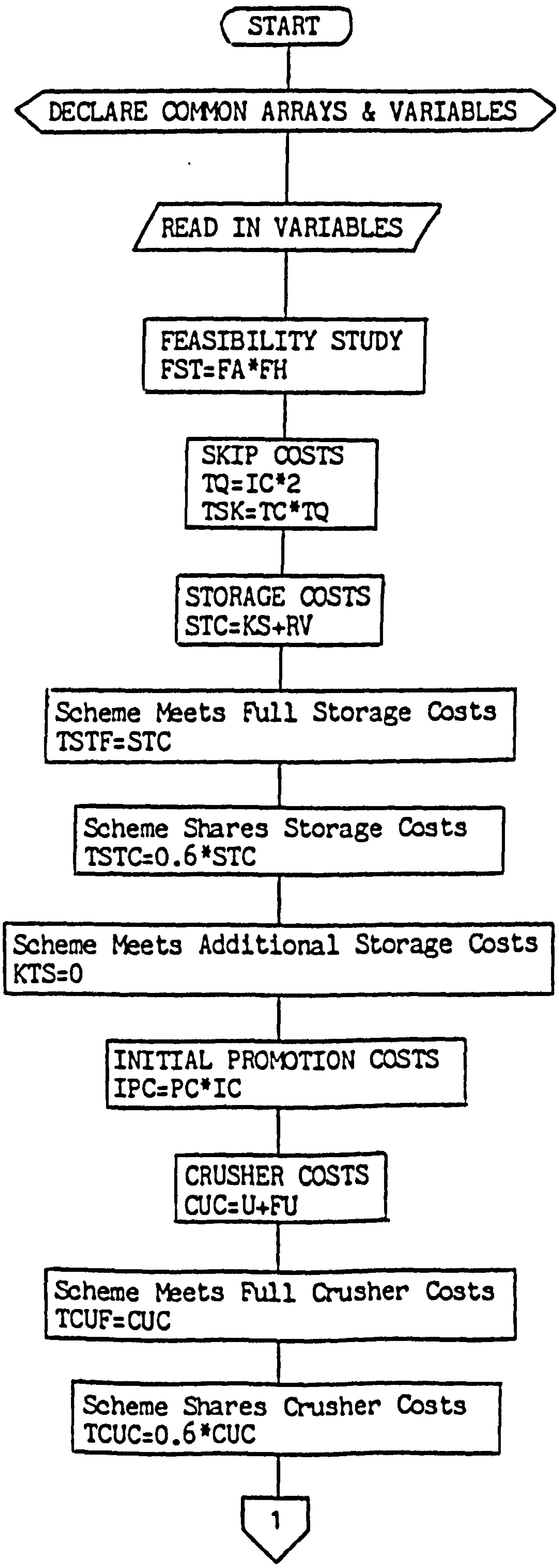

```
4000    FORMAT(' ',2X,'Trade Revenue',16X,10(F8.1,1X))
        WRITE(32,4100)(CM(21,L),L=2,11)
4100    FORMAT(' ',2X,'Collection Savings',11X,10(F8.1,1X))
        WRITE(32,4200)(CM(22,L),L=2,11)
4200    FORMAT(' ',2X,'Trade Changes',16X,10(F8.1,1X))
        WRITE(32,4300)(CM(23,L),L=1,11)
4300    FORMAT('0','PRIVATE SURPLUS',8X,11(F8.1,1X))
        WRITE(32,4400)DFP
4400    FORMAT(' ','Discount At',F5.1,'%')
        WRITE(32,4500)(CM(24,L),L=1,11)
4500    FORMAT('+',20X,11(F8.3,1X))
        WRITE(32,4600)(CM(25,L),L=1,11)
4600    FORMAT('0','PRESENT VALUE',10X,11(F8.1,1X))
        WRITE(32,4700)PNPV
4700    FORMAT(' ','NET PRESENT VALUE = ',F12.2)
        WRITE(32,4800)
4800    FORMAT('0','  ')
        WRITE(32,4900)(CM(26,L),L=1,11)
4900    FORMAT('0','SYSTEMS SURPLUS',8X,11(F8.1,1X))
        WRITE(32,5000)DFP
5000    FORMAT(' ','Discount At',F5.1,'%')
        WRITE(32,5100)(CM(27,L),L=1,11)
5100    FORMAT('+',20X,11(F8.3,1X))
        WRITE(32,5200)(CM(28,L),L=1,11)
5200    FORMAT(' ','PRESENT VALUE',10X,11(F8.1,1X))
        WRITE(32,5300)SNPV
5300    FORMAT(' ','NET PRESENT VALUE = ',F12.2)
        WRITE(32,5400)
5400    FORMAT('0','   ')
        WRITE(32,5500)(CM(29,L),L=1,11)
5500    FORMAT('0','TOTAL SURPLUS',10X,11(F8.1,1X))
        WRITE(32,5600)DFP
5600    FORMAT(' ','Discount At',F5.1,'%')
        WRITE(32,5700)(CM(30,L),L=1,11)
5700    FORMAT('+',20X,11(F8.3,1X))
        WRITE(32,5800)(CM(31,L),L=1,11)
5800    FORMAT(' ','PRESENT VALUE',10X,11(F8.1,1X))
        WRITE(32,5900)TNPV
5900    FORMAT(' ','NET PRESENT VALUE = ',F12.2)
        WRITE(32,6000)
6000    FORMAT('0','   ')
        STOP
        END
```

Flow Diagram For Investment Appraisal Of A Trade Recycling Scheme



1

Scheme Meets Additional Crusher Costs (Fuel Costs)
CTC=0

VEHICLE INVESTMENT
VI=NV*V

Scheme Meets Full Vehicle Costs
TVIF=VI

Scheme Shares Vehicle Costs
TVI=0.2*VI

Scheme Meets Additional Vehicle Costs
TVIM=0

TOTAL TRADE SET UP COSTS
Full Costs: TFSUC=TSK+TSTF+IPC+TCUF+TVIF
Shares Costs: TTSUC=TSK+TSTC+IPC+TCUC+TVI
Extra Costs: TMSUC=TSK+TKS+IPC+CTC+TVIM

GROSS TONNAGE RECOVERED
TRT=0.05*(0.01*Z*(X*IC))

LABOUR COSTS
Meets Full Costs: TLAB=50*(DW+NL*LC)*(1+0.01*AC)
Shares Costs: TTLB=0.2*TLAB
Meets Extra Costs: TMLB=0

VEHICLE COSTS
Full Costs: TV=NV*50*TM
Shares Costs: TTV=0.2*TV
Extra Costs: TMTV=Fuel Costs

SKIP MAINTENANCE
TSKM=TQ*TKM

ADMINISTRATION COSTS
TA=TH*TW

ON-GOING PROMOTION
TPUB=IC*PB

2

2

CRUSHER OPERATING COSTS
COC=50*(CLC+CNL)*(1+0.01*AC)
Full Costs: CLAB=COC
Shares Costs: TCLB=0.2*CLAB
Extra Costs: TCMB=0

CRUSHER SUPPLIES & SERVICES
CSS=CSPT*0.05*(0.01*Z*(X*IC))
Full Costs: CSC=CSS
Shares Costs: TCSC=0.2*CSS
Extra Costs: TCMC=0

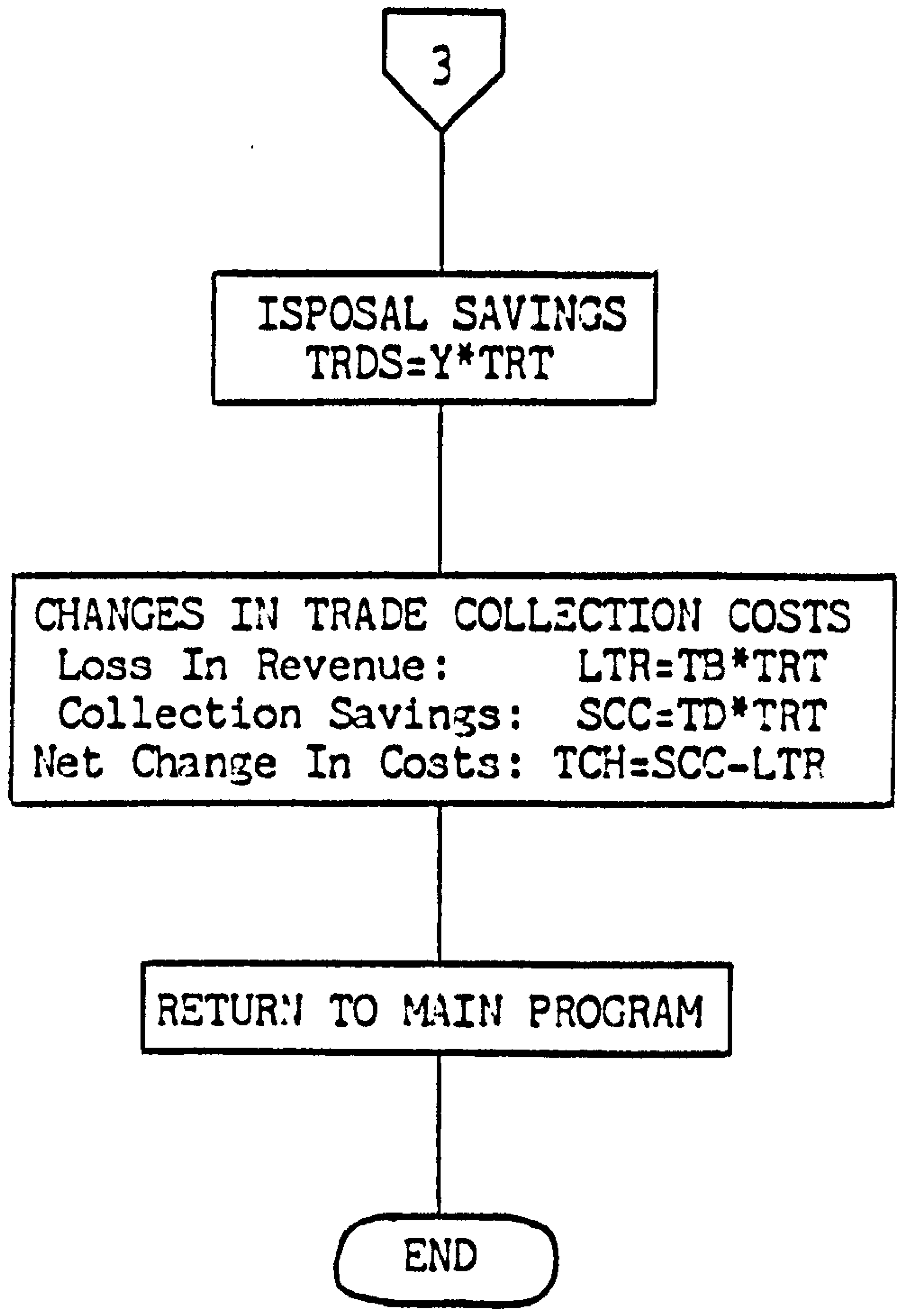
STORAGE MAINTENANCE
TSTM=SM*SH

BULK TRANSPORT OF TRADE GLASS
TBTR=(TR+TL)*TRT

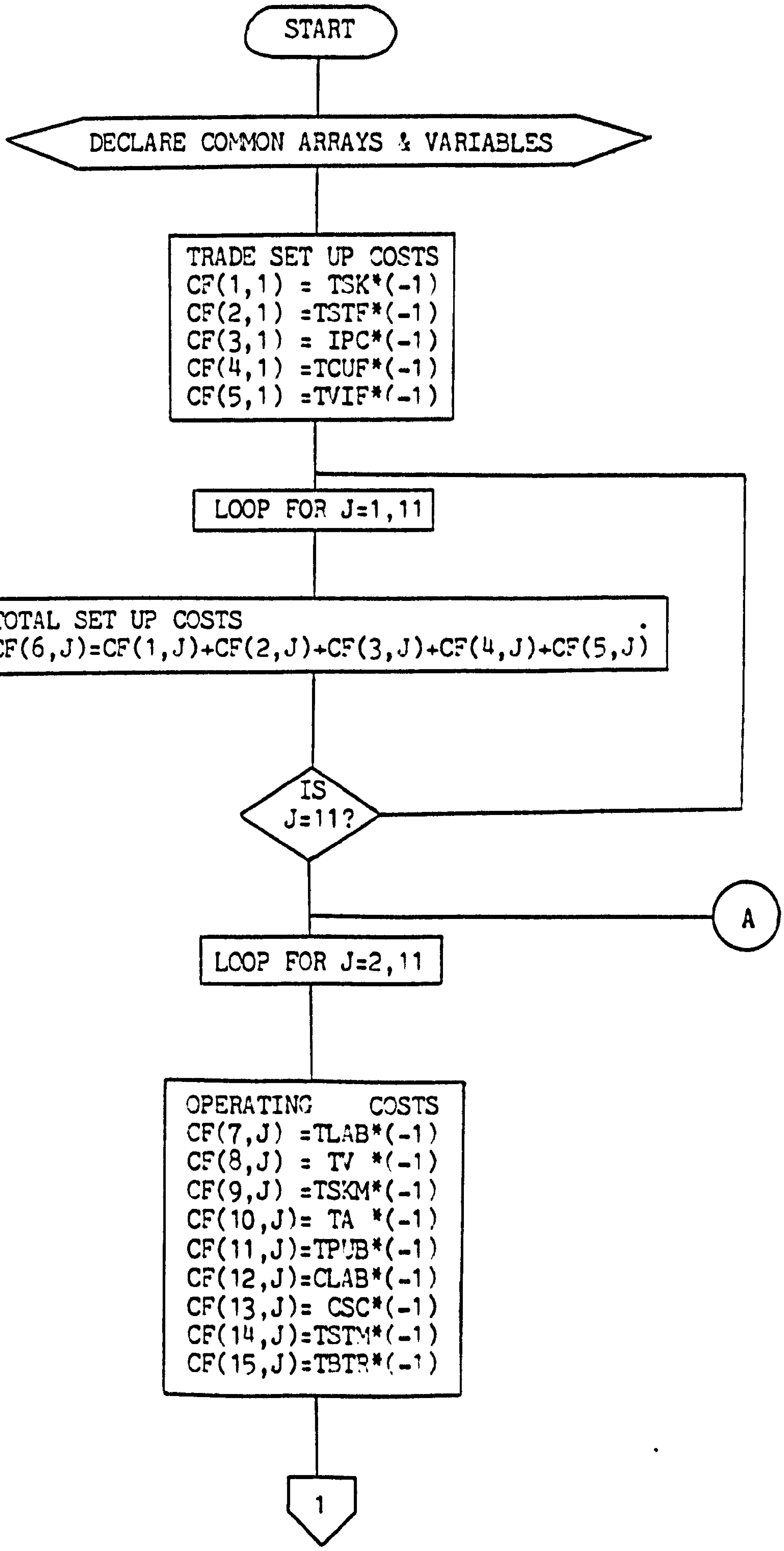
TOTAL TRADE OPERATING COSTS
Full Costs:
TFOPC=TLAB+TV+TSKM+TA+TPUB+CLAB+CSC+TSTM+TBTR
Shares Costs:
TTOPC=TTLB+TTV+TSKM+TA+TPUB+TCLB+TCSC+TSTM+TBTR
Extra Costs:
TMOPC=TMLB+TMTV+TSKM+TA+TPUB+TCMB+TCMC+TSTM+TBTR

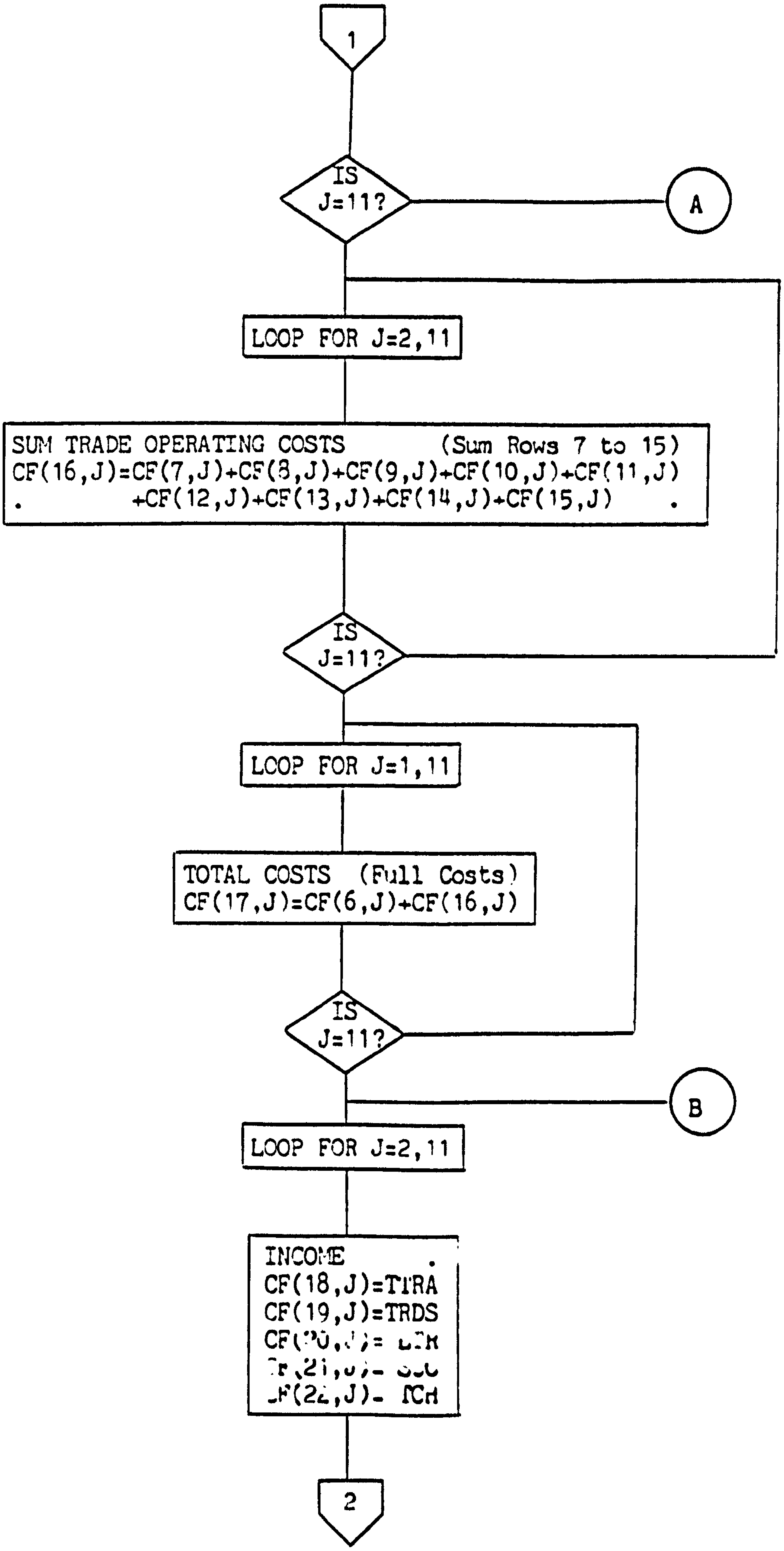
SALES REVENUE
Clear Glass: TTP1=P1*PCG*TRT
Green Glass: TTP2=P2*PGG*TRT
Amber Glass: TTP3=P3*PAG*TRT
Mixed Glass: TTP4=P4*PMG*TRT
TOTAL: TTRA=TTP1+TTP2+TTP3+TTP4

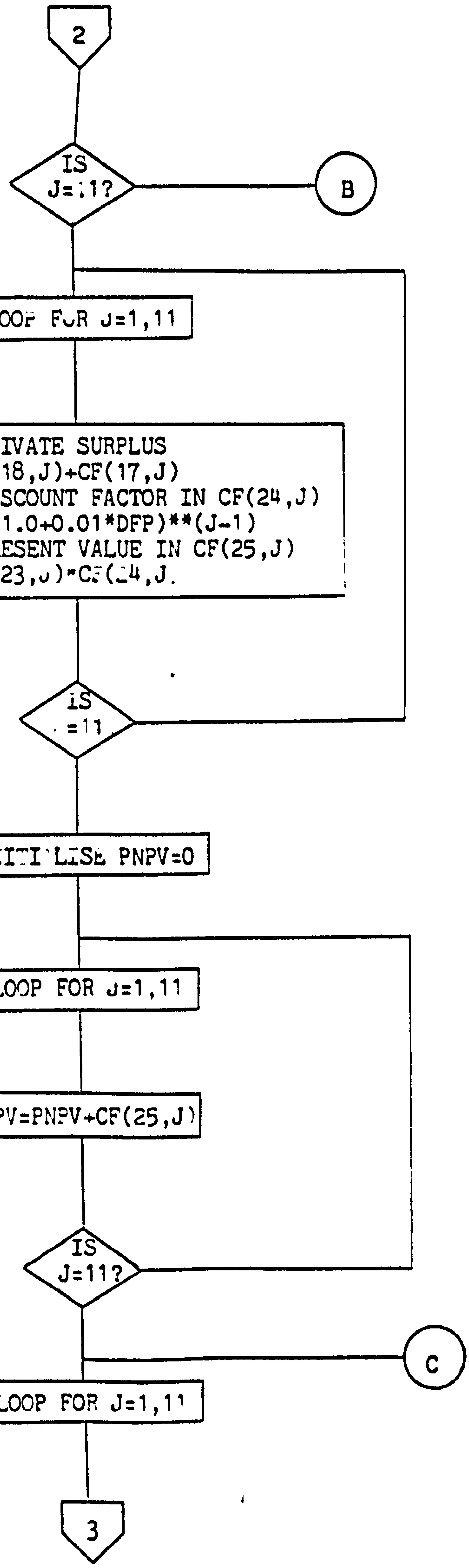
3

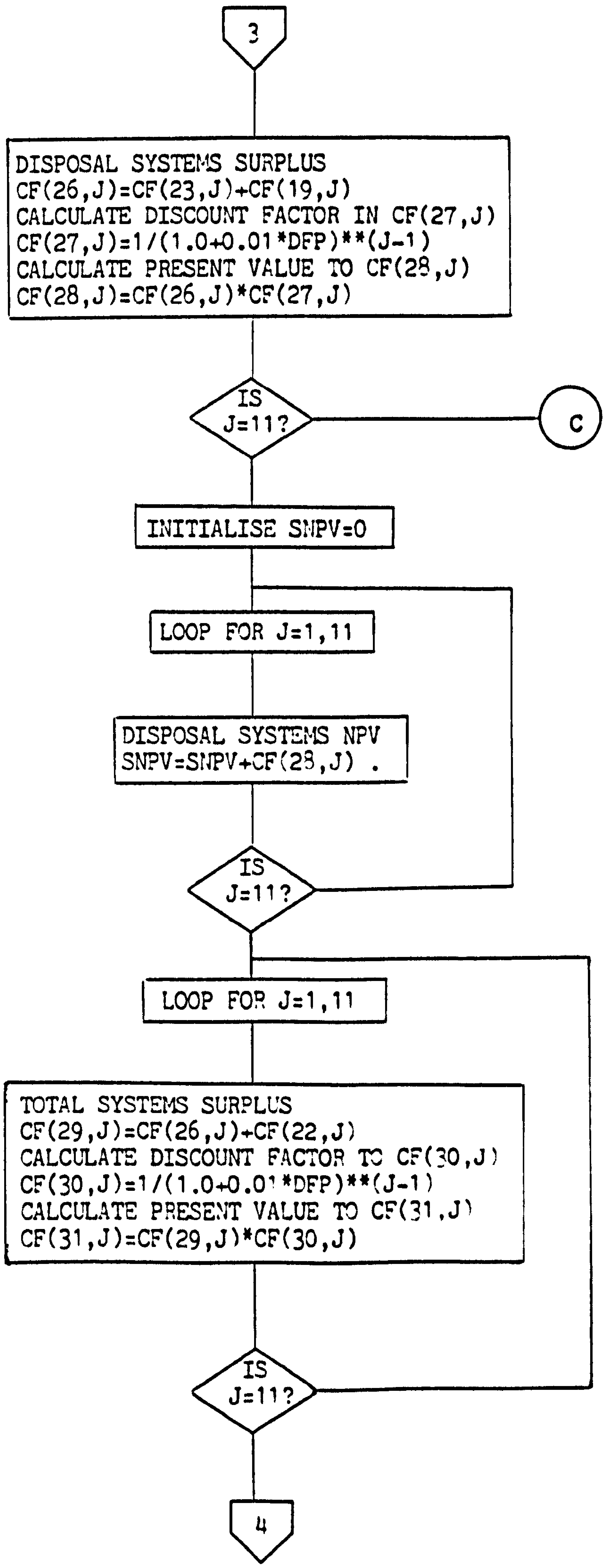

3
ISPOSAL SAVINGS
TRDS=Y*TRT
CHANGES IN TRADE COLLECTION COSTS
Loss In Revenue: LTR=TB*TRT
Collection Savings: SCC=TD*TRT
Net Change In Costs: TCH=SCC-LTR
RETURN TO MAIN PROGRAM
END

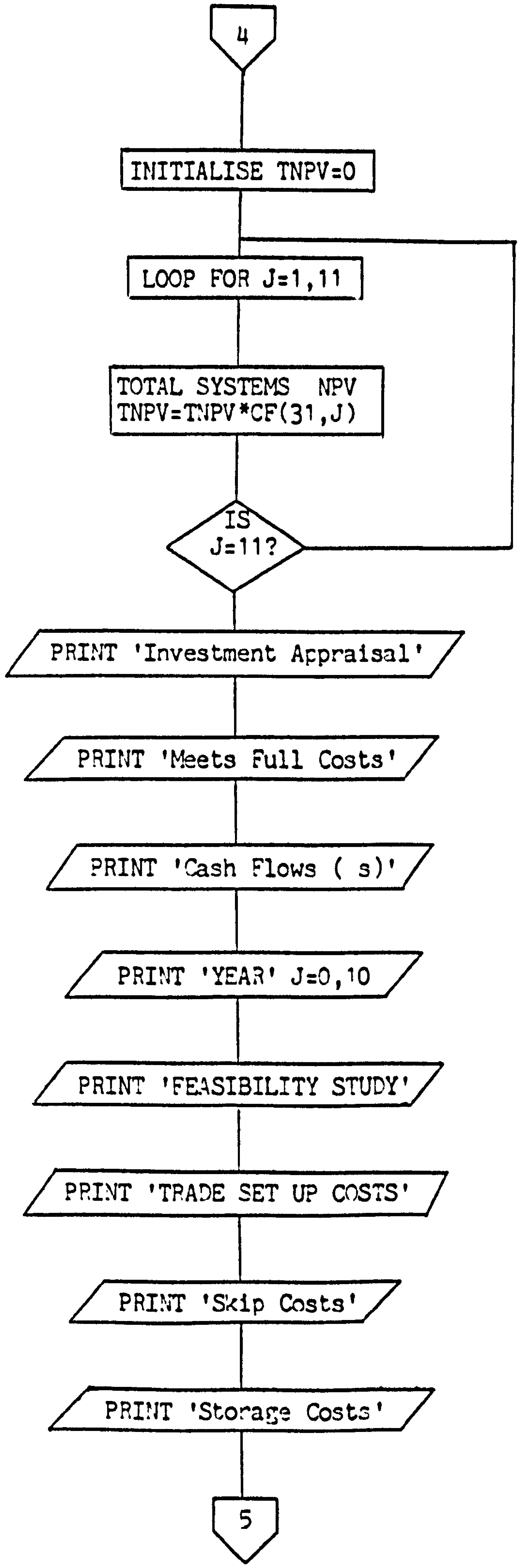
SUBROUTINE CASHFULL

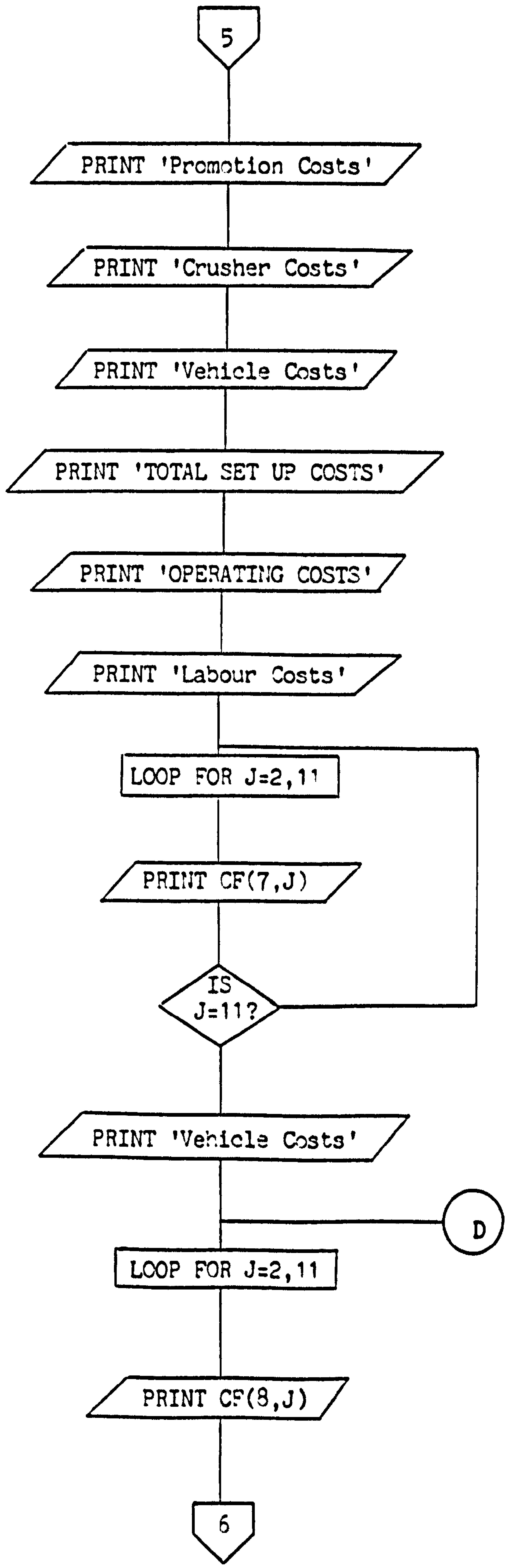


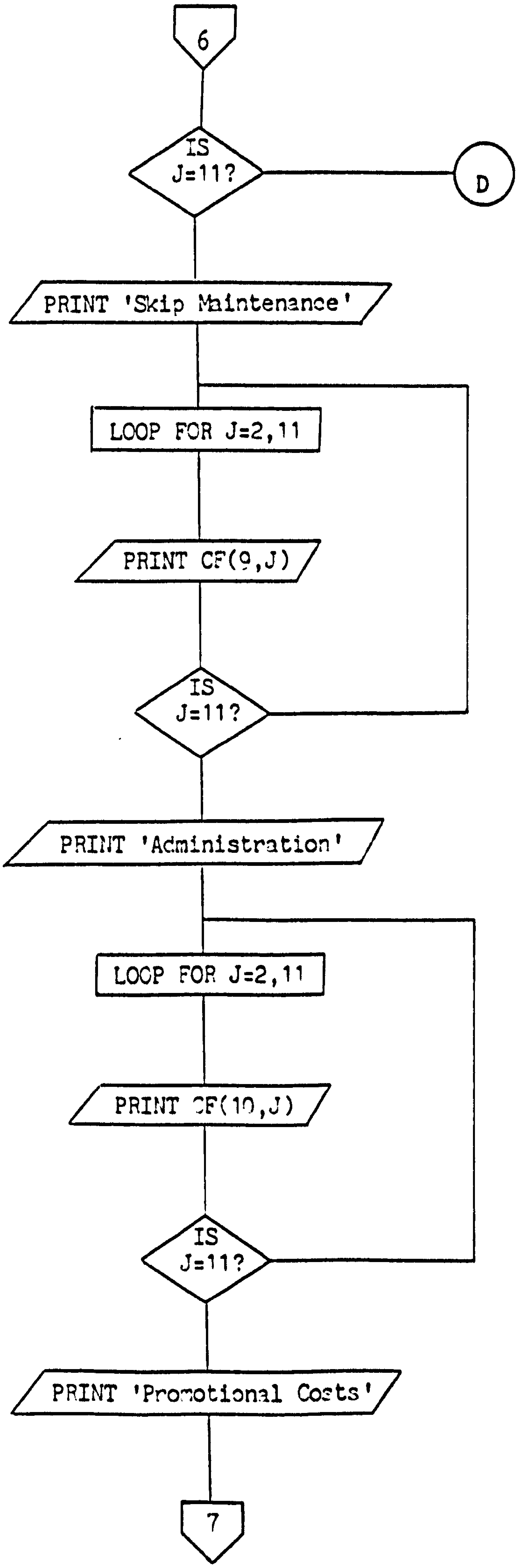

1
IS J=11?
A
LOOP FOR J=2,11
SUM TRADE OPERATING COSTS (Sum Rows 7 to 15)
CF(16,J)=CF(7,J)+CF(8,J)+CF(9,J)+CF(10,J)+CF(11,J)
+CF(12,J)+CF(13,J)+CF(14,J)+CF(15,J)
IS J=11?
LOOP FOR J=1,11
TOTAL COSTS (Full Costs)
CF(17,J)=CF(6,J)+CF(16,J)
IS J=11?
B
LOOP FOR J=2,11
INCOME
CF(18,J)=TIRA
CF(19,J)=TRDS
2

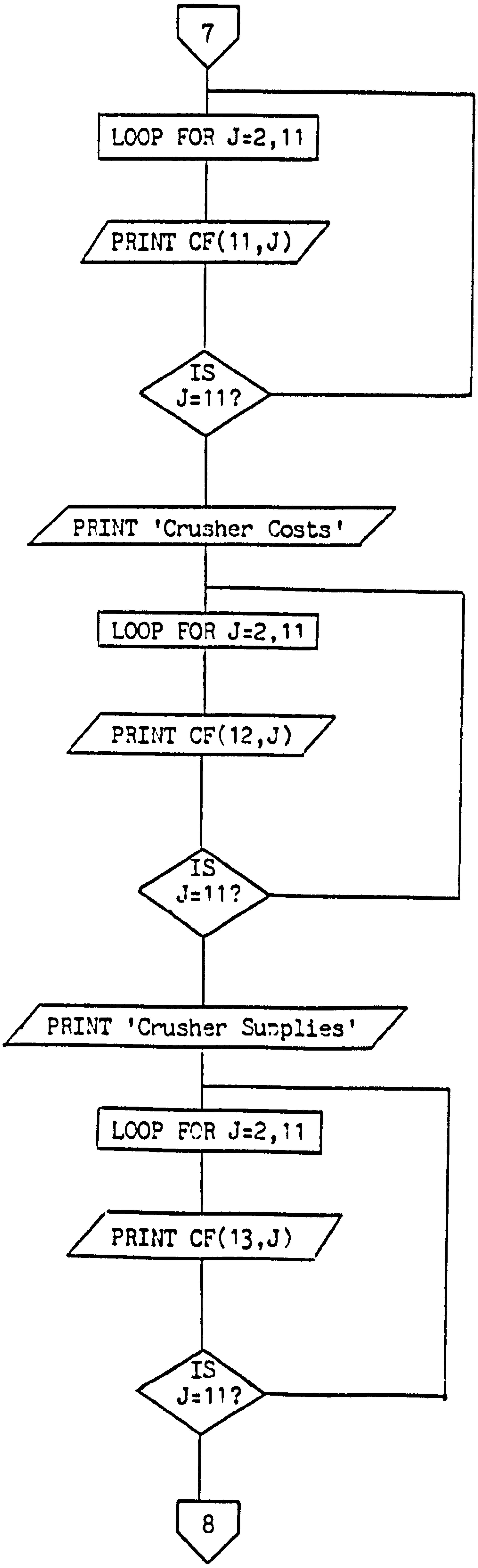

2
IS J=11?
B
LOOP FOR J=1,11
CALCULATE PRIVATE SURPLUS
CF(23,J)=CF(18,J)+CF(17,J)
CALCULATE DISCOUNT FACTOR IN CF(24,J)
CF(24,J)=1/(1.0+0.01*DFP)**(J-1)
CALCULATE PRESENT VALUE IN CF(25,J)
CF(25,J)=CF(23,J)*CF(24,J)
IS J=11
INITIALISE PNPV=0
LOOP FOR J=1,11
PNPV=PNPV+CF(25,J)
IS J=11?
C
LOOP FOR J=1,11
3

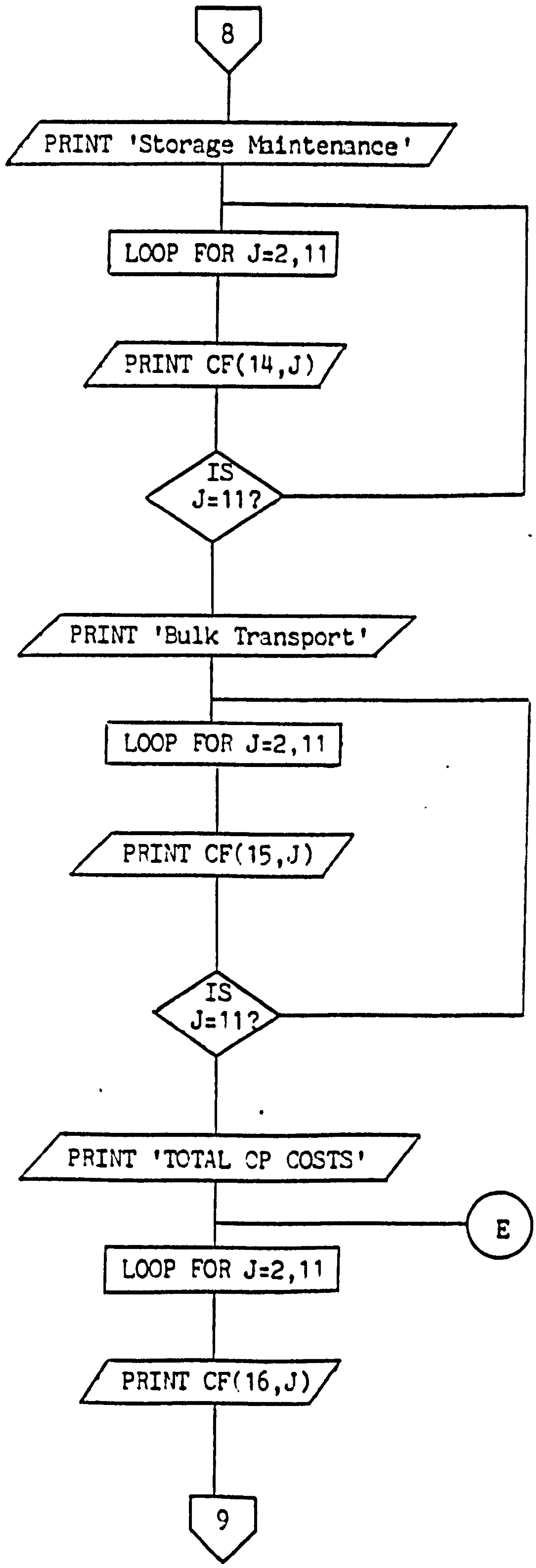

3
DISPOSAL SYSTEMS SURPLUS
CF(26,J)=CF(23,J)+CF(19,J)
CALCULATE DISCOUNT FACTOR IN CF(27,J)
CF(27,J)=1/(1.0+0.01*DFP)**(J-1)
CALCULATE PRESENT VALUE TO CF(28,J)
CF(28,J)=CF(26,J)*CF(27,J)
IS J=11?
C
INITIALISE SNPV=0
LOOP FOR J=1,11
DISPOSAL SYSTEMS NPV
SNPV=SNPV+CF(28,J) .
IS J=11?
LOOP FOR J=1,11
TOTAL SYSTEMS SURPLUS
CF(29,J)=CF(26,J)+CF(22,J)
CALCULATE DISCOUNT FACTOR TO CF(30,J)
CF(30,J)=1/(1.0+0.01*DFP)**(J-1)
CALCULATE PRESENT VALUE TO CF(31,J)
CF(31,J)=CF(29,J)*CF(30,J)
IS J=11?
4

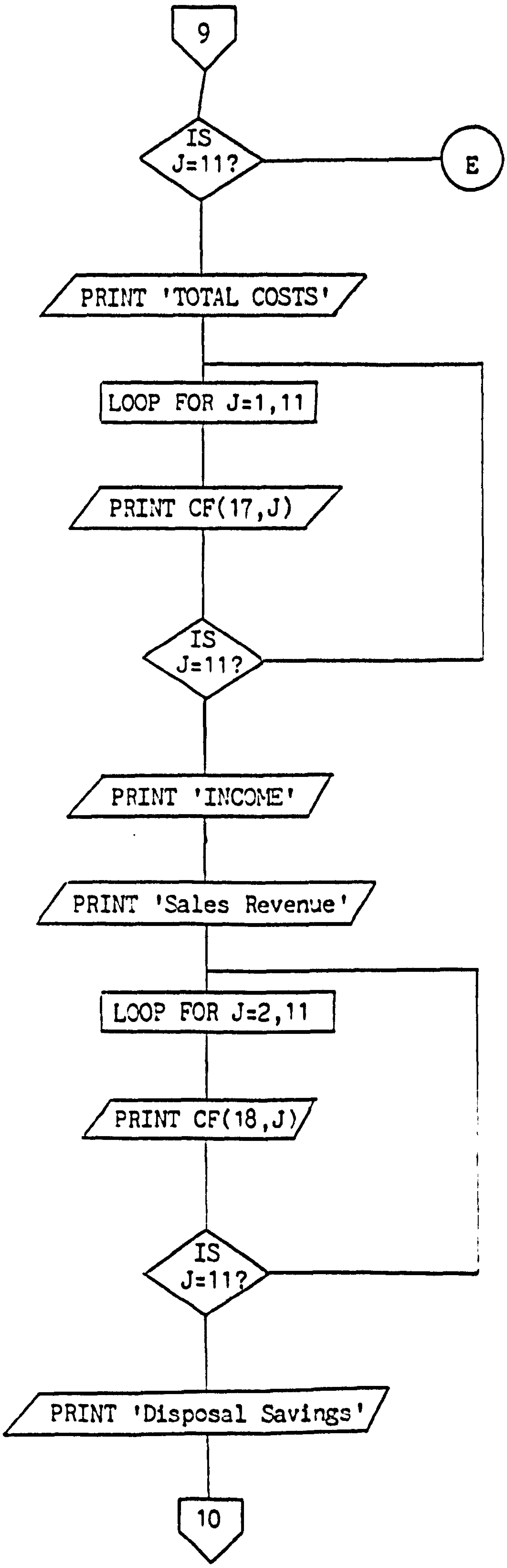

4
INITIALISE TNPV=0
LOOP FOR J=1,11
TOTAL SYSTEMS NPV
TNPV=TNPV*CF(31,J)
IS
J=11?
PRINT 'Investment Appraisal'
PRINT 'Meets Full Costs'
PRINT 'Cash Flows (s)'
PRINT 'YEAR' J=0,10
PRINT 'FEASIBILITY STUDY'
PRINT 'TRADE SET UP COSTS'
PRINT 'Skip Costs'
PRINT 'Storage Costs'
5

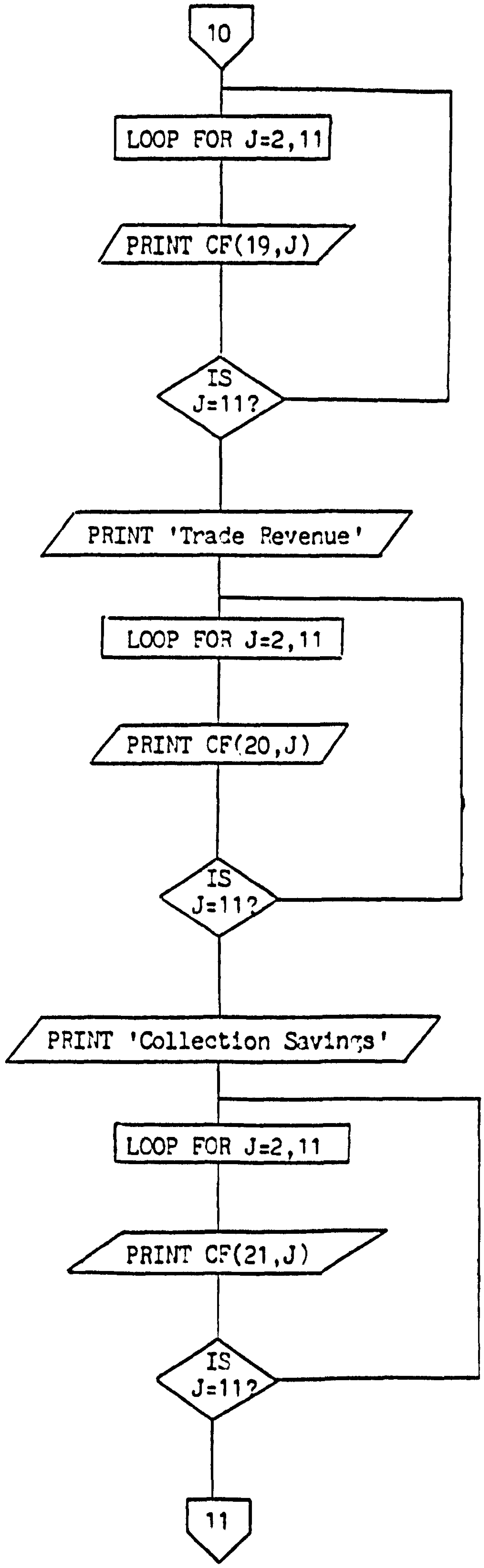

5
PRINT 'Promotion Costs'
PRINT 'Crusher Costs'
PRINT 'Vehicle Costs'
PRINT 'TOTAL SET UP COSTS'
PRINT 'OPERATING COSTS'
PRINT 'Labour Costs'
LOOP FOR J=2,11
PRINT CF(7,J)
IS J=11?
PRINT 'Vehicle Costs'
D
LOOP FOR J=2,11
PRINT CF(8,J)
6

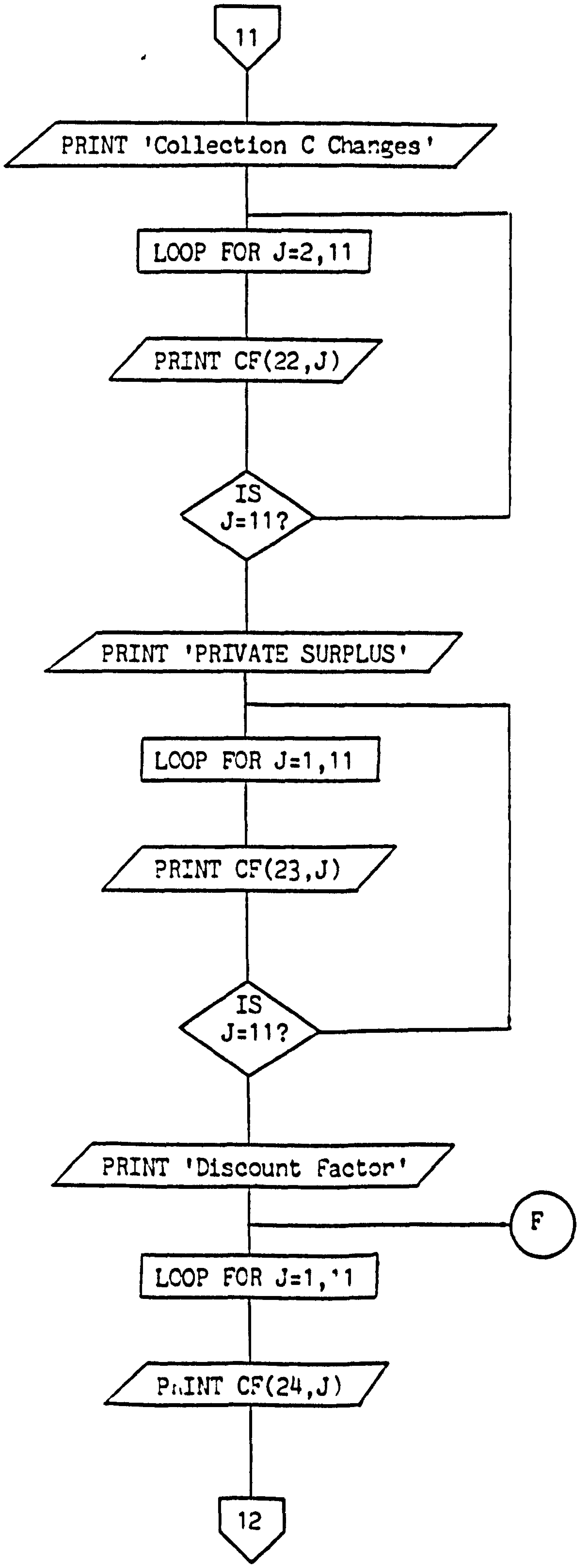

6
IS J=11?
D
PRINT 'Skip Maintenance'
LOOP FOR J=2,11
PRINT CF(9,J)
IS J=11?
PRINT 'Administration'
LOOP FOR J=2,11
PRINT CF(10,J)
IS J=11?
PRINT 'Promotional Costs'
7

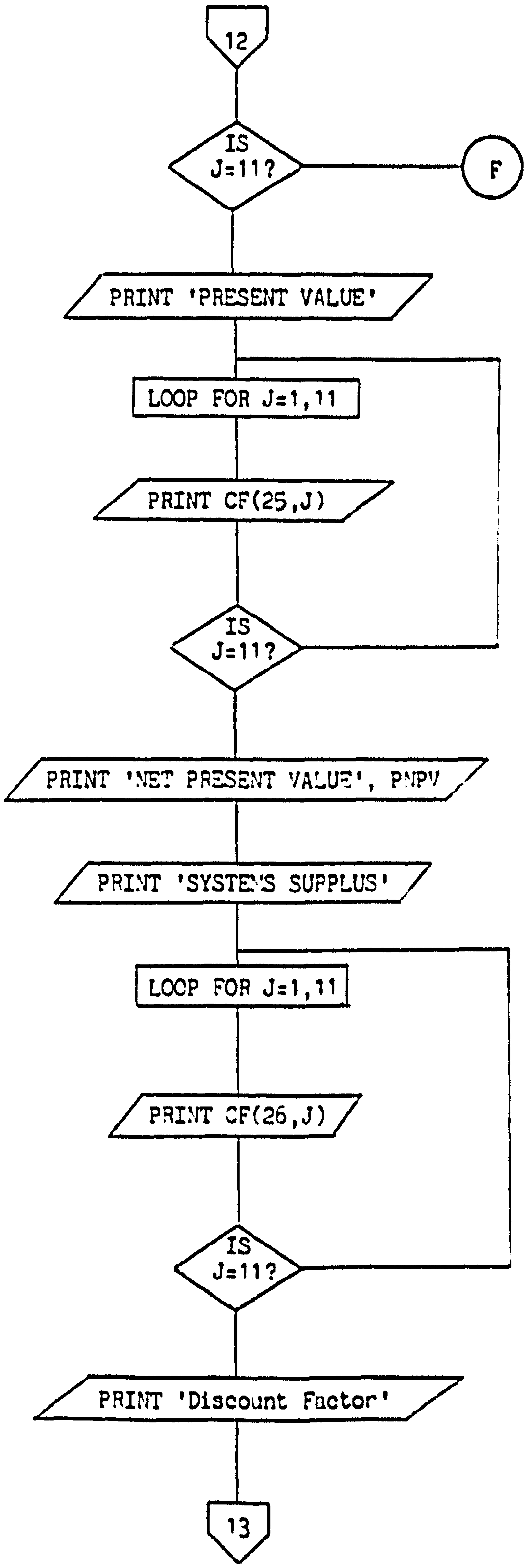

7
LOOP FOR J=2,11
PRINT CF(11,J)
IS J=11?
PRINT 'Crusher Costs'
LOOP FOR J=2,11
PRINT CF(12,J)
IS J=11?
PRINT 'Crusher Supplies'
LOOP FOR J=2,11
PRINT CF(13,J)
IS J=11?
8

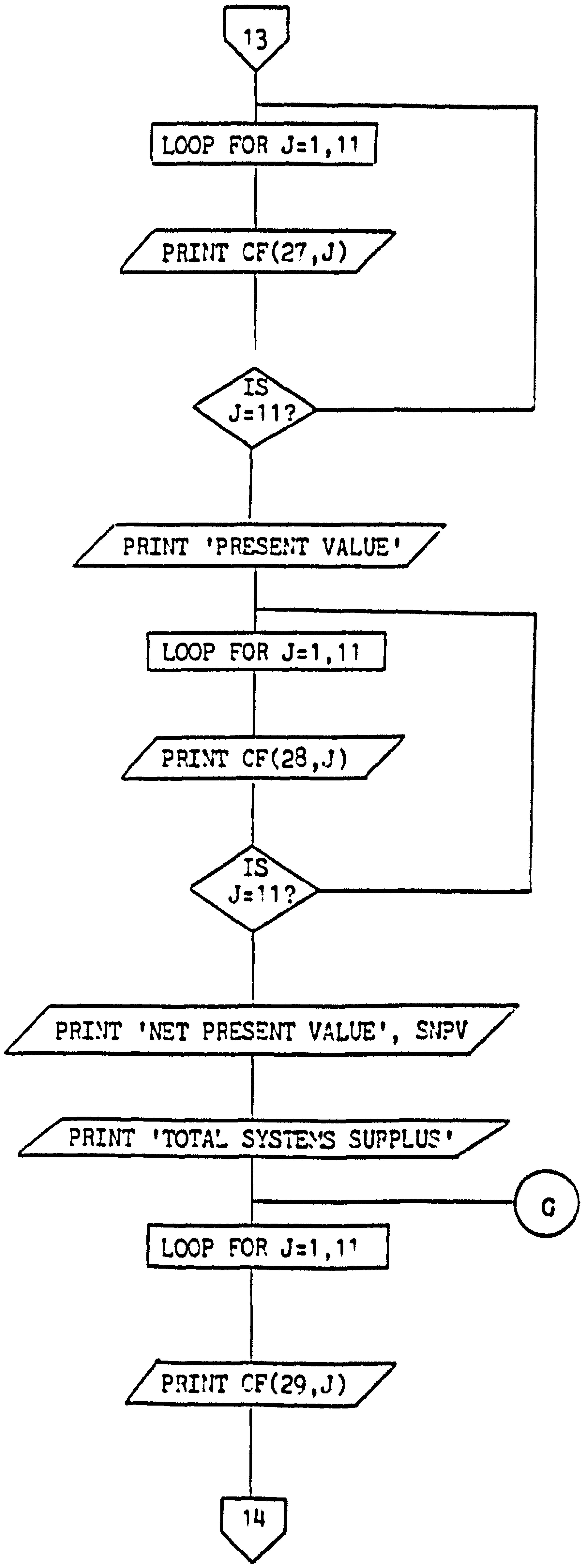

8
PRINT 'Storage Maintenance'
LOOP FOR J=2,11
PRINT CF(14,J)
IS J=11?
PRINT 'Bulk Transport'
LOOP FOR J=2,11
PRINT CF(15,J)
IS J=11?
PRINT 'TOTAL CP COSTS'
E
LOOP FOR J=2,11
PRINT CF(16,J)
9

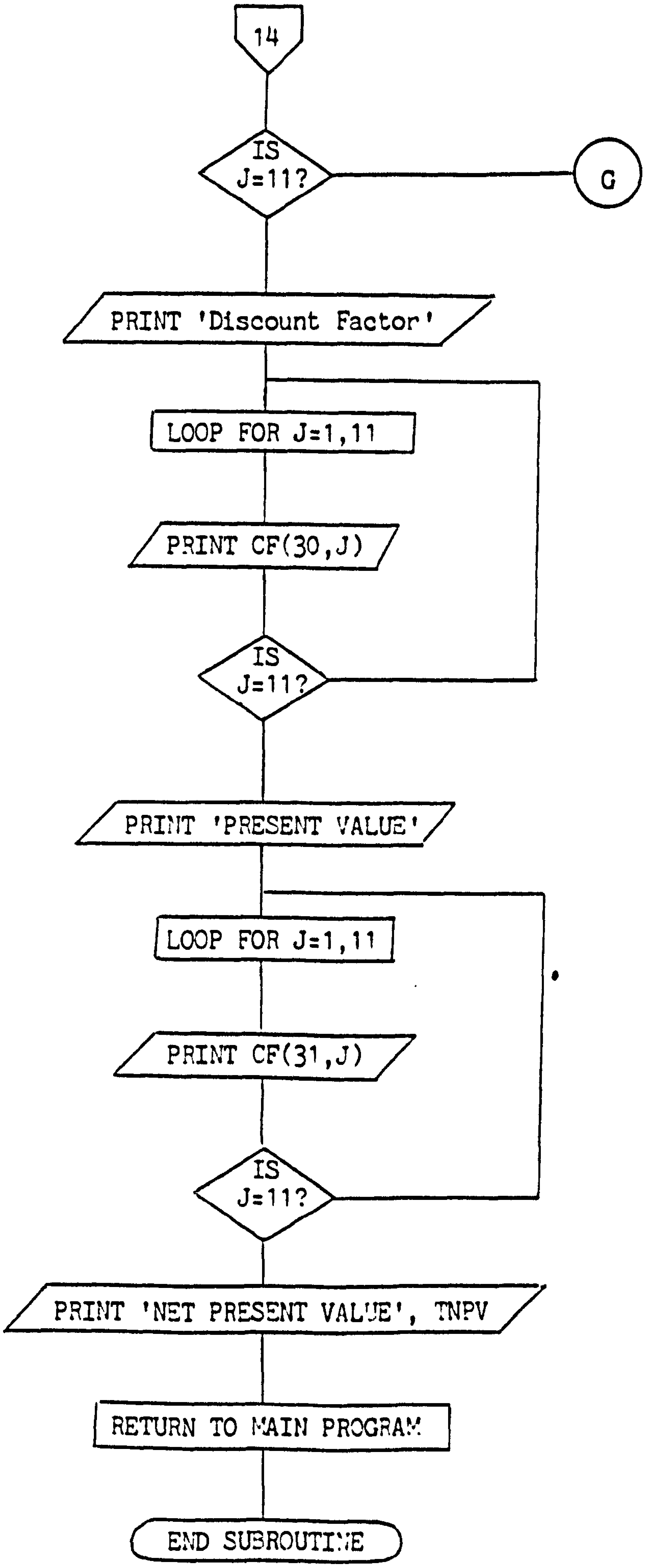

9
IS J=11?
E
PRINT 'TOTAL COSTS'
LOOP FOR J=1,11
PRINT CF(17,J)
IS J=11?
PRINT 'INCOME'
PRINT 'Sales Revenue'
LOOP FOR J=2,11
PRINT CF(18,J)
IS J=11?
PRINT 'Disposal Savings'
10


10
LOOP FOR J=2,11
PRINT CF(19,J)
IS J=11?
PRINT 'Trade Revenue'
LOOP FOR J=2,11
PRINT CF(20,J)
IS J=11?
PRINT 'Collection Savings'
LOOP FOR J=2,11
PRINT CF(21,J)
IS J=11?
11


11
PRINT 'Collection C Changes'
LOOP FOR J=2,11
PRINT CF(22,J)
IS J=11?
PRINT 'PRIVATE SURPLUS'
LOOP FOR J=1,11
PRINT CF(23,J)
IS J=11?
PRINT 'Discount Factor'
F
LOOP FOR J=1,'1
PRINT CF(24,J)
12


12
IS J=11?
F
PRINT 'PRESENT VALUE'
LOOP FOR J=1,11
PRINT CF(25,J)
IS J=11?
PRINT 'NET PRESENT VALUE', PNPV
PRINT 'SYSTEMS SURPLUS'
LOOP FOR J=1,11
PRINT CF(26,J)
IS J=11?
PRINT 'Discount Factor'
13


13
LOOP FOR J=1,11
PRINT CF(27,J)
IS J=11?
PRINT 'PRESENT VALUE'
LOOP FOR J=1,11
PRINT CF(28,J)
IS J=11?
PRINT 'NET PRESENT VALUE', SNPV
PRINT 'TOTAL SYSTEMS SUPPLUS'
G
LOOP FOR J=1,11
PRINT CF(29,J)
14


14
IS J=11?
G
PRINT 'Discount Factor'
LOOP FOR J=1,11
PRINT CF(30,J)
IS J=11?
PRINT 'PRESENT VALUE'
LOOP FOR J=1,11
PRINT CF(31,J)
IS J=11?
PRINT 'NET PRESENT VALUE', TNPV
RETURN TO MAIN PROGRAM
END SUBROUTINE

H.1 Data File For Trade Class Investment Model

VARIABLE	IC
VALUE	200

VARIABLE	TC	TQ	KS	RV
VALUE	8.0	100.0	10.0	0.0

VARIABLE	NV	[illegible]	U	FU
VALUE	1	35000	0	0

VARIABLE	DW	NL	LC	AC
VALUE	140.0	2	140	140

VARIABLE	TM
VALUE	140

VARIABLE	CLC	CNL
VALUE	0	0

VARIABLE	TA
VALUE	0

VARIABLE	TOGP
VALUE	0

VARIABLE	TR	TL
VALUE	4.0	0.5

VARIABLE	TB	TD	Y
VALUE	5	5	0

VARIABLE	P1	P2	P3	P4
VALUE	22.0	18.0	18.0	18.0

VARIABLE	PCG	PGG	PAG	PMG
VALUE	0.0	0.0	0.0	1.0

VARIABLE	Z	X
VALUE	30	29

VARIABLE	DFP
VALUE	10

SHARES COSTS
Cash Flows (£)

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
TRADE SET UP COSTS (Shares Costs)											
Skip Costs	-3200.0										
Storage Costs	-624.0										
Promotion Costs	0.0										
Crusher Costs	0.0										
Vehicle Costs	-7000.00										
TOTAL SET UP COSTS	-10824.0										
Trade Operating Costs											
Labour Costs		-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	[illegible]	-5460.0	-5460.0
Vehicle Costs		-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	[illegible]	-1400.0	-1400.0
Skip Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
Administration		0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
Promotional Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
Crusher Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
Crusher Supplies		0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
Storage Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
Bulk Transport		-391.5	-391.5	-391.5	391.5	391.5	-391.5	-391.5	[illegible]	-391.5	-391.5
TOTAL OP COSTS		-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	[illegible]	-7251.5	-7251.5
TOTAL COSTS	10824.0	7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	7251.	-7251.5	-7251.5	-7251.5
INCOME											
Sales Revenue		1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	[illegible]	1566.0	1566.0
Disposal Savings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
Trade Revenue		434.0	434.0	434.0	434.0	434.0	434.0	434.0	[illegible]	434.0	434.0
Collection Savings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
Trade C Changes		1.0	1.0	1.0	1.0	1.0	1.0	1.0	[illegible]	1.0	1.0
PRIVATE SURPLUS	-39140.0	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	[illegible]	-33125.5	-33125.5
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	[illegible]	0.424	0.386
PRESENT VALUE	-10824.0	-5168.6	-4698.8	-4271.6	-3883.3	-3530.2	-3209.3	-2917.6	[illegible]	-2411.2	-2192.0

NET PRESENT VALUE = -45758.93

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
SYSTEMS SURPLUS	-10824.0	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	[illegible]	-5685.5	-5685.5
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	[illegible]	0.424	0.386
Present Value	-10824.0	-5168.6	-4698.8	-4271.6	-3883.3	-3530.2	-3209.3	-2917.6	[illegible]	-2411.2	-2192.0

Net Present Value = -45758.93

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
TOTAL SURPLUS	-10824.0	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	[illegible]	-5684.5	-5684.5
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	[illegible]	0.424	0.386
Present Value	-10824.0	-5167.7	-4697.9	-4270.8	-3882.6	-3529.6	-3208.8	-2917.0	[illegible]	-2410.8	-2191.6

Net Present Value = -45752.79

SHARES COSTS

Cash Flows (s)

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
TRADE SET UP COSTS (Shares Costs)											
Skip Costs	-3200.0										
Storage Costs	-624.0										
Promotion Costs	0.0										
Crusher Costs	0.0										
Vehicle Costs	-7000.00										
TOTAL SET UP COSTS	.0824.0										
Trade Operating Costs											
Labour Costs		-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	60.0	-5460.0	-5460.0
Vehicle Costs		-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	00.0	-1400.0	-1400.0
Skip Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Administration		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Promotional Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Supplies		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Storage Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bulk Transport		-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	91.5	-391.5	-391.5
TOTAL OP COSTS		-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	51.5	-7251.5	-7251.5
TOTAL COSTS	-10824.0	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-72[illegible]5	-7251.5	-7251.5	-7251.5
INCOME											
Sales Revenue		1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	66.0	1566.0	1566.0
Disposal Savings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trade Revenue		434.0	434.0	434.0	434.0	434.0	434.0	434.0	34.0	434.0	434.0
Collection Savings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trade C Changes		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PRIVATE SURPLUS	-39240.0	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	125.5	-33125.5	-33125.5
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
PRESENT VALUE	-10824.0	-5168.6	-4698.8	-4271.6	-3883.3	-3530.2	-3209.3	-2917.6	652.3	-2411.2	-2192.0

NET PRESENT VALUE = -45758.93

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
SYSTEMS SURPLUS	-10824.0	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	685.5	-5685.5	-5685.5
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
Present Value	-10824.0	-5168.6	-4698.8	-4271.6	-3883.3	-3530.2	-3209.3	-2917.6	652.3	-2411.2	-2192.0

Net Present Value = -45758.93

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
TOTAL SURPLUS	-10824.0	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	684.5	-5684.5	-5684.5
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
Present Value	-10824.0	-5167.7	-4697.9	-4270.8	-3882.6	-3529.6	-3208.8	-2917.0	-[illegible]1.9	-2410.8	-2191.6

Net Present Value = -45752.79

Investment Appraisal Model For Trade Sites

Scheme Meets Extra Costs

Cash Flows (s)

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
TRADE SET UP COSTS											
Skip Costs	-3200.0										
Storage Costs	0.0										
Promotion Costs	0.0										
Crusher Costs	0.0										
Vehicle Costs	0.0										
TOTAL SET UP COSTS	-3200.0										
Labour Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vehicle Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Skip Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Administration		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Promotional Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Supplies		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Storage Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bulk Transport		-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5
TOTAL OP COSTS		-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5
TOTAL COSTS	-3200.0	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5
INCOME											
Sales Revenue		1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0
Disposal Savings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trade Revenue		434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0
Collection Savings		435.0	435.0	435.0	435.0	435.0	435.0	435.0	435.0	435.0	435.0
Trade Changes		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PRIVATE SURPLUS	-3200.0	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
PRESENT VALUE	-3200.0	1067.7	970.7	882.4	802.2	729.3	663.0	602.7	547.9	498.1	452.8
NET PRESENT VALUE =	4016.79										
[illegible] SURPLUS	-3200.0	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
PRESENT VALUE	-3200.0	1067.7	970.7	882.4	802.2	729.3	663.0	602.7	547.9	498.1	452.8
NET PRESENT VALUE =	4016.79										
TOTAL SURPLUS	-3200.0	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5
Discount At 10.0%	1.000	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
PRESENT VALUE	-3200.0	1068.6	971.5	883.1	802.9	729.9	663.5	603.2	548.4	498.5	453.2
NET PRESENT VALUE =	[illegible]										

Investment Appraisal For Trade Recovery Scheme

Meets Full Costs
Cash Flows (s)

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
FEASIBILITY STUDY	0.0										
TRADE SET UP COSTS											
Skip Costs	-3200.0										
Storage Costs	-1040.0										
Promotion Costs	0.0										
Crusher Costs	0.0										
Vehicle Costs	-35000.0										
TOTAL SET UP COSTS	-39240.0										
OPERATING COSTS											
Labour Costs		-27300.0	-27300.0	-27300.0	-27300.0	-27300.0	-27300.0	-27300.0	-27300.0	-27300.0	-27300.0
Vehicle Costs		-7000.0	-7000.0	-7000.0	-7000.0	-7000.0	-7000.0	-7000.0	-7000.0	-7000.0	-7000.0
Skip Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Administration		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Promotional Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Supplies		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Storage Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bulk Transport		-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5
TOTAL OP COSTS		-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5
TOTAL COSTS	-39240.0	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5	-34691.5
INCOME											
Sales Revenue		1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0
Disposal Savings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trade Revenue		434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0
Collection Savings		435.0	435.0	435.0	435.0	435.0	435.0	435.0	435.0	435.0	435.0
Collection Changes		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PRIVATE SURPLUS	-39240.0	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5
Discount At 5.0 %	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
PRESENT VALUE	-39240.0	-31548.1	-30045.8	-28615.1	-27252.4	-25954.7	-24718.8	-23541.7	-22420.7	-21353.0	-20336.2

NET PRESENT VALUE = -295026.41

SYSTEMS SURPLUS	-39240.0	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5
Discount At 5.0%	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
Present Value	-39240.0	-31548.1	-30045.8	-28615.1	-27252.4	-25954.7	-24718.8	-23541.7	-22420.7	-21353.0	-20336.2

Net Present Value = -295026.41

TOTAL SURPLUS	-39240.0	-33124.5	-33124.5	-33124.5	-33124.5	-33124.5	-33124.5	-33124.5	-33124.5	-33124.5	-33124.5
Discount At 5.0	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
PRESENT VALUE	-39240.0	-31547.1	-30044.9	-28614.2	-27251.6	-25953.9	-24718.0	-23541.0	-22420.0	-21352.4	-20335.6

NET PRESENT VALUE = [illegible]

INVESTMENT APPRAISAL FOR TRADE RECOVERY SCHEME

SHARES COSTS

Cash Flows (s)

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
TRADE SET UP COSTS (Shares Costs)											
Skip Costs	-3200.0										
Storage Costs	-624.0										
Promotion Costs	0.0										
Crusher Costs	0.0										
Vehicle Costs	-7000.00										
TOTAL SET UP COSTS	-10824.0										
Trade Operating Costs											
Labour Costs		-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	-5460.0	-5460.0
Vehicle Costs		-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	-1400.0	-1400.0
Skip Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Administration		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Promotional Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Supplies		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Storage Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bulk Transport		-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5
TOTAL OP COSTS		-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5
TOTAL COSTS	-10824.0	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5	-7251.5
INCOME											
Sales Revenue		1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0
Disposal Savings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trade Revenue		434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0
Collection Savings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trade C Changes		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PRIVATE SURPLUS	-39240.0	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5	-33125.5
Discount At 5.0%	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
PRESENT VALUE	-10824.0	-5414.8	-5156.9	-4911.3	-4677.5	-4454.7	-4242.6	-4040.6	-3848.2	-3664.9	-3490.4
NET PRESENT VALUE =	54725.94										
SYSTEMS SURPLUS	-10824.0	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5	-5685.5
Discount At 5.0%	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
Present Value	-10824.0	-5414.8	-5156.9	-4911.3	-4677.5	-4454.7	-4242.6	-4040.6	-3848.2	-3664.9	-3490.4
Net Present Value =	-54725.94										
TOTAL SURPLUS	-10824.0	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5	-5684.5
Discount At 5.0%	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
Present Value	-10824.0	-5413.8	-5156.0	-4910.5	-4676.7	-4454.0	-4241.9	-4039.9	-3847.5	-3664.3	-3489.8
Net Present Value =	-54718.21										

Scheme Meets Extra Costs

Cash Flows (s)

	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR10
TRADE SET UP COSTS											
Skip Costs	-3200.0										
Storage Costs	0.0										
Promotion Costs	0.0										
Crusher Costs	0.0										
Vehicle Costs	0.0										
TOTAL SET UP COSTS	-3200.0										
Labour Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vehicle Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Skip Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Administration		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Promotional Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Costs		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crusher Supplies		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Storage Maintenance		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bulk Transport		-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5
TOTAL OP COSTS		-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5
TOTAL COSTS	-3200.0	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5	-391.5
INCOME											
Sales Revenue		1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0	1566.0
Disposal Savings		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trade Revenue		434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0	434.0
Collection Savings		435.0	435.0	435.0	435.0	435.0	435.0	435.0	435.0	435.0	435.0
Trade Changes		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
PRIVATE SURPLUS	-3200.0	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5
Discount At 5.0%	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
PRESENT VALUE	-3200.0	1118.6	1065.3	1014.6	966.3	920.3	876.4	834.7	794.9	757.1	721.0
NET PRESENT VALUE =	5869.18										
SYSTEMS SURPLUS	-3200.0	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5	1174.5
Discount At 5.0%	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
PRESENT VALUE	-3200.0	1118.6	1065.3	1014.6	966.3	920.3	876.4	834.7	794.9	757.1	721.0
NET PRESENT VALUE =	5869.18										
TOTAL SURPLUS	-3200.0	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5	1175.5
Discount At 5.0%	1.000	0.952	0.907	0.864	0.823	0.784	0.746	0.711	0.677	0.645	0.614
PRESENT VALUE	-3200.0	1119.5	1066.2	1015.4	967.1	921.0	877.2	835.4	795.6	757.7	721.7
NET PRESENT VALUE =	5876.90										

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