DISTRIBUTING THE COST

H.H. Todgham, P.Eng., O.L.S.

The original program notes indicated that I would talk about estimating the cost and preparing an assessment. In my opinion, preparing an assessment is considerably more difficult than estimating the cost and in view of this I intend to spend only a very small amount of time talking avout the cost estimate.

Estimate of Cost

Estimating the cost of a drainage works is really not much different from estimating the cost of any other type of construction. The costs of all the work set out in the plan, profile and specification are to be included, of course. The Engineer must then add to these costs of the physical work the fees of the Engineer for the report and for the supervision of construction, as well as the fees of the municipal clerk and the costs of printing and distributing the copies of the bylaw, and the Municipal Board fee. These items are all simply estimates and when the various pieces of work have been done, it may turn out that the costs will be slightly higher or slightly lower but this is of no consequence, although it is hoped that the Engineer has been reasonably accurate in his estimating.

While the Engineer would probably not include such items in his original Estimate of Cost it's interesting to note, in passing, that costs of appeals to the Court of Revision and to the County Judge can properly be charged against the drainage area in many cases. This could even apply to costs of appeals to the Referee although if the reason for the appeal was that the municipality was at fault in its procedure, it might be that the costs would go against the municipality itself instead of the drainage area.

There is one item included in the cost of the drainage works, however, which is not really an estimate. I refer to the allowances which the Engineer must fix under Section 8 of The Drainage Act, 1962-63, and I should like to say just a few words about them, at this point:

Allowances:

Section 8 says that there are 5 things for which the Engineer shall provide allowances and he must determine the amounts of these allowances to be paid to each owner concerned. These allowances are for:

1. Damages, if any, to lands and crops caused by the disposal of material. Section 8 (1)

2. Severance resulting from the work. Section 8 (6)

3. Private drains incorporated into the drainage works Section 8 (7)

4. Land required for the project. Section 8 (8)

5. Compensation in lieu of continuing the drainage works to a sufficient outlet. Section 8 (9)

It is absolutely essential that these allowances be realistic and I cannot over-emphasize this. It has been suggested that on certain occasions some allowances have been grossly inflated in order to buy the co-operation of an owner who might otherwise have fought a particular drainage scheme. This practice is most unfair to the other owners, of course, and I believe it is also quite unethical.

In this matter of allowances, there are a few words of caution that I should like to give:

1. If your report is being made after the crops have been planted and if you are sure that the work will proceed at once and the crops already in will be destroyed, it certainly makes sense to pay for the full value of the crop in the disposal area, less the cost of harvesting it. However if the work won't be done until next year, the owner should know better than to plant crop in the disposal area, so the allowance should only be enough to compensate him for part of the profit that he will lose from having this piece of land out of production for one season. I might say, in this regard, that it is usually better to spread the excavated material over a fairly wide strip so that the farmer can plough it down and get it back into cultivation as easily as possible, rather than leave the material piled deeply on a narrow strip where it will interfere with the flow of surface water and make the operation of farm machinery difficult.

2. Generally, if an access bridge or culvert or a farm bridge or culvert is required to be constructed, replaced, or enlarged, it is best for the Engineer to provide for this to be done as part of the work, under Section 8 (4) or Section 8 (5). However, if a bridge or culvert is not required for the time being, at least, an allowance for severance should be made and this allowance for severance should only be enough to pay for any increased severance caused by the drainage works. If this is a completely new ditch, the severance will be substantial but, even so, the maximum allowance that should be made is the market value of the land cut off from the rest of the farm or the cost of installing a crossing whichever is the lesser. In the case of enlarging an old ditch, the allowance for severence should only be that amount by which the cost of constructing a crossing is increased by the work of enlargement in case the owner should wish later on to install a crossing. The allowance for severance (except in the case of a new ditch) should <u>not</u> be the full cost of installing a bridge or culvert.

3. Care must be taken in determining the value of a private drain incorporated into the work. If it is an old tile, it may have outlived its usefulness and thus have little actual value. If it is an open ditch, the ditch may be grown up with brush or trees and the cost of removing these may offset the saving due to the reduced quantity of excavation. Usually the allowance for a private drain is a nominal one unless it happens that the owner has just recently dug a ditch of the required size in a suitable location, in which case payment of the actual cost would probably be justified.

4. An allowance is usually paid for whatever land may be required to construct a new ditch but many Engineers make no allowance for land if they are simply widening an existing one. When an allowance of this type is made, it is usually for the market value of the land or, sometimes, it may be for a multiple of the assessed value, adhering to whatever practice the Municipality follows in buying land for road widening.

5. The compensation paid in lieu of taking the drain to a sufficient outlet is ordinarily not more than the market value of the land that will be subject to increased flooding. If the land has always flooded naturally, an allowance should be paid only for that part that will be worse off after the drain has been built than it was in a state of nature. Another thing to remember about this is that once an allowance has been paid to land for this purpose, subsequent owners have no right to require that the Municipality provide drainage to the property. This could prove to be a serious handicap in the future, for some property, and the Engineer should give serious consideration to these consequences before he decides to make an allowance for this purpose.

6. I think it is quite obvious that any or all of the 5 types of allowances could be paid in the case of the original construction of a drainage works. Probably, any or all except the allowance for private drains could be paid when a drain is being improved but the amount of allowance would be related only to the amount of the improvement. It is questionable, however, if any of the allowances other than those related to the disposal of material should be paid when the work on the drain is simply one of repair or maintenance.

DISTRIBUTION OF COST, OR, ASSESSMENT

Once all of the costs have been added together, a total estimated cost is arrived at and under Section 3 of The Drainage Act, 1962-63, the Engineer must then make an assessment of this cost against the lands and roads liable to be assessed. At this point, I should like to make it quite clear that my remarks today have to do strictly with my own methods of distributing the cost of drainage works. There are no formulae nor are there any laid down mathematical equations and I really can't speak for the others in the engineering profession. So far as I know, though, I think that the methods I shall describe conform to the requirements of the laws concerned and that most of the Engineers in this part of the Province follow the same general procedures.

As Mr. Steele said in his paper, the Engineer must follow proper principles of assessing the cost of the work, otherwise he does not comply with the requirements of the Act and he thereby leaves his whole report open to attack. Mr. Steele referred to the very recent case known as Anderson et al versus Township of Thurlow and I think it might be instructive to look briefly at the Reasons for Judgement of Referee Clunis in this particular case:

In essence, the report provided for the repair of an existing drain some $3\frac{1}{2}$ miles in length, together with the construction of a 3 mile long branch emptying into it. Every owner of land fronting on either the existing main drain or the branch was assessed for benefit at

a flat rate of $6.00 per acre of land, regardless of any other consideration -- whether it lay near the mouth or at the head of the work. The only test seemed to be whether or not a farm abutted the work and apparently no attention was paid to the effect that the work would have on any particular parcel.

The Referee concluded that this was such a completely erroneous method he could not suggest any amendments to correct it and so he set the report aside.

What is a proper principle of assessment, then?

The first and foremost criteria are that drainage assessments must be based on an examination of the area by the Engineer and on his independent judgement. In his well-know book, The Drainage Acts, Proctor quotes the late Mr. Justice Street who said:

"The legislature did not intend that the sums to be assessed against the lands affected by drains constructed under these clauses should be governed by arrangements made between the Councils of adjoining Townships, but endeavoured to secure that they should be fixed in each case by a sworn professional man upon his own skill and judgement." Mr. Justice Street also said: "The Engineer acting under these sections is exercising functions of a judicial nature, and is bound to apportion the cost of the work amongst the different parcels of land receiving benefit from it, strictly according to the benefit derived, according to the best of his skill, judgement and ability: each person and municipality charged with a portion of the cost is entitled to the advantage of his unbiased judgement."

Perhaps we can now try to develop some guide lines for the exercise of this judgement. There are several sections of The Drainage Act, 1962-63, that relate to what the Engineer must do in making his assessment. These are Sections 8 (2 & 3), 9, 10, 13, 14, 15, 16, 17, 18, and 21 (3). I think all but Section 15 and 16 are reasonably straight forward and I therefore intend to concentrate on the actual distribution of cost under these two sections.

There are two distinct and separate ways of distributing the estimated cost of a drainage works:

1. Pro Rate Assessment

By "Pro Rata Assessment" we mean that the estimated cost is divided among all of the properties in exactly the same proportion as the cost was divided under the last previous report and bylaw. To make such an assessment, one takes the assessment schedule from the last report and "Pro Rates" the present estimated cost over all of the properties shown in the old bylaw. If a particular parcel paid, say, 12% of the cost the last time, it would be assessed 12% of the cost this time.

Usually, this method may be used only if the following 5 conditions exist:

(1) The work is strictly the repair of an existing Municipal drain.

(2) The work covers the same length of drain as the last previous report and bylaw.

(3) The work to be done is similar in all respects to the work under the previous report.

(4) The conditions and land use in the watershed have not changed since the last report.

(5) The Engineer who made the previous report and assessment was knowledgeable and experienced.

If all five of these conditions exist, a pro rata assessment may be justified but if any of the five conditions are missing, however, this method is quite improper. Occasionally, the pro rata method may not be valid even though all five conditions do exist. Here, again, the Engineer must exercise his judgement to decide whether or not it is reasonable to use this method.

2. New Assessment

If the pro rata method is not appropriate then an entirely new assessment must be worked out.

Section 15 of The Drainage Act, 1962-63 sets our 3 types of assessment:

Benefit,

Outlet liability

Injuring liability.

Let's look at the last, first. "Injuring liability" is well defined in Section 1 of the Act but it is seldom used. There are a variety of reasons for this that we do not have time to discuss today. It is quite proper to use it if you wish but you must be certain that if you do, you comply with the definition in the Act. Because injuring liability is used so seldom, it is my intention to pass by it in the interests of saving time.

Let's look next, at Benefit -

To assess for benefit there must be a special benefit to the lands assessed, not just some probable general benefit to all of the lands in the locality. This may fall into either of the two following categories, or it may be a combination of the two:

(a) Benefit may be reflected by a higher market price that the property will demand after the work is completed than it would have brought before the work was done.

(b) Benefit may be an agricultural benefit. This type of benefit was dealt with at some length by the speakers this morning.

Let us look first, for a moment, at the matter of higher market price. There are many ways in which a drain can increase the value of a piece of land. Some of these might be as follows:

1. Be taking away from the land more quickly the water which falls upon it -- that is, direct drainage.

2. By confining to a channel water from upstream lands which might otherwise spread over low parts of the property in question.

3. By cutting off the natural flow of surface water from adjoining lands and stopping it from coming onto the land in question -- usually known as cut-off.

4. By providing a new or improved crossing over the drain -- either a bridge or culvert. Of course this may be either a farm culvert or an access culvert.

5. By removing and disposing of brush and dead trees, and generally cleaning up the ditch.

6. By regrading the drain banks and repairing any erosion or wash-ins that may have occurred along the bank.

7. By enclosing the drain either for a short distance (as across a lawn) in a pipe or by installing tile for a greater distance.

8. By draining off the waters of a swamp or slough and making the land pleasanter to live on.

And I am sure there are many other ways that each of you have already encountered.

If either of these -- benefit from a higher market price or improved agricultural conditions -- will be brought about by the drainage works then each parcel of land may be assessed under the heading of "Benefit" a certain amount for each improvement it receives. The obvious question now, of course, is how do you actually handle the dollars, but we shall discuss this later.

First let's talk about <u>Outlet</u>:

To assess for outlet, an engineer must be able to show that either:

(a) The lands can be more effectively drained after completion of the work than before because they will have an outlet they did not have before, or

(b) The work is necessary in order to carry the drain to a "sufficient outlet" so that the water can be discharged safely and will

do no injury to land or roads.

It is important to observe that Section 16 (1) says "Lands that use a drainage works as an outlet ..... or for which an improved outlet is provided either directly or indirectly ..... may be assessed for outlet liability." Here there are two significant points:

1. The Engineer can assess not only lands already using the drain but also those for which an improved outlet is provided whether the owner actually makes use of it right now, or not.

2. The Engineer can assess not only the lands directly connected to the drain but also those indirectly connected and these may lie at some distance away from the proposed work.

It is also important to observe that Section 16 (3) says "the assessment for outlet ..... shall be based upon the volume and rate of flow of the water artificially caused to flow ..... into the drainage works from the lands ..... liable for such assessments."

The key words here are:

"Volume"

"Rate of flow"

"Artificially caused to flow"

The Engineer can assess only for the water "artificially caused to flow" and not for water flowing naturally. The speed with which the water is made to run off the land is a factor so that completeness of a farm's drainage system must be considered. Since volume is also a factor, the area draining and the percentage of rainfall that runs off a particular property must also be considered.

It is interesting to note in the case of Caradoc versus Ekfrid (Ontario appeal reports Vol. 24, page 576) Referee E.M. Britton, Q.C., in discussing "outlet liability" says the "per acre assessment of all lands for which the drainage work will be an improved outlet, and charging such lands according to the cost of the part of the work used or that will be used by them is a proper way to arrive at the amount that the Township should be called upon to contribute. It is quite impossible to make the assessment absolutely correct. The amount of evaporation and absorption cannot be so measured and determined as to enable the Engineer to say how much less water one lot within the drainage area further away from the drainage work will send than another lot nearer to the work."

In Summary

If you had to assign specific dollar values to each of the considerations that we have just reviewed, as they affect each property, it would be a very difficult job. Fortunately this is not required since we need only to apply enough total assessment to recover the cost

of the work. This means that a farm may actually benefit from a drain to the extent of, say, $10,000 because its market value may be increased by this amount as a result of the work but we may assess it only, say, $2,200 because that is all we have to collect as that farm's share of the total cost of the work. What this means is that when you make up an assessment schedule, you don't enter in it the full value of the "benefit" and "outlet" that each farm receives but, rather, a smaller figure that reflects the appropriate share of the total value of the "benefit" and "outlet" received by all the farms put together. To be able to do this, of course, you have to determine which of all the possible factors are a consideration and whether they affect one farm more than another. For example, if the market value of one farm will be increased twice as much as that of another farm then, obviously, its benefit assessment should be twice as great. Similarly, if the volume and rate of flow of the water artificially caused to flow from one farm is three times as great as from another, then the outlet assessment should be three times as great also. So you see, it becomes a matter of "relatives" rather than "absolutes", and the ultimate test for any schedule of assessment is this:

"Is it fair to all concerned? Can I compare the assessments on any two properties (either neighbouring or in remote parts of the watershed) and say that they are being fairly charged for the good they will derive?"

As to Method

Let's suppose that we have decided on the work to be done and we have estimated the cost. How exactly do we go about Distributing the Cost? I prefer to divide the total length of the work into several logical sections that may vary anywhere from 1000 to 3000 feet long. Then, I determine the cost of the work on each of these sections and I divide the cost of each section among those properties that are entitled to be assessed for it, partly as Benefit and partly as Outlet, having in mind the various considerations we have already talked about. This, of course, is the whole point of this paper. How, indeed, do you take the number of dollars that you estimate as the cost of the work on a section of the drain and decide exactly how many of these dollars should be assessed against each property affected by this section? Frankly, my method is not easy to explain in words but Professor Irwin has suggested that I might demonstrate it by an example and this does seem to be the best way to approach the problem. In preparing this example, I have tried to introduce as great a variety of situations as possible and I hope it will be helpful to you.

Before looking at the Example, there are some Rules that almost always apply (although I admit there may be a few exceptions) and this may be a good time to list them:

1. You can't assess a property any part of the cost of work that is done upstream from it (unless this happens to be some type of cut-off diversion, but this is a special case).

2. You can't assess a property for Benefit for work done some

distance downstream although you can assess it for Outlet on this work.

3. You can't assess for Benefit lands that are not reasonably close to the drain. (Usually those assessed for Benefit are abutting the drain or, perhaps, one farm removed).

4. You can't assess those lands in a watershed which have a natural drainage of their own. (These are usually the high lands toward the outer edge of the watershed).

5. You can't assess those lands that are too low to make any use of the work such as gravel pits, marl beds, etc.

6. You can't assess riparian owners (that is, those whose land abuts unimproved sections of a natural watercourse). However, once part of a natural watercourse has been artificially improved the owners abutting the improvement lose this immunity.

7. You can assess a railway (the Railways Act, Section 273) for the increase in cost of the proposed drainage works caused by the construction and operation of the railway.

8. You can assess a public utility (The Drainage Act, 1962-63, Section 21) for the increase in the cost of the proposed drainage works caused by the existence of the works of the public utility. The Bell Telephone Company, Tans-Canada Pipelines, and other utilities holding federal charters take the position that they are not subject to the Drainage Act, 1962-63, since it is a provincial Act, and it appears that they are correct in taking this position.

There is one other area that we have not dealt with but which seems to be creating problems these days and this is the matter of distribution of the cost of Road Crossings.

This is dealt with in the Drainage Act in Section 8 (2 and 3). Subsection 2 requires that the Engineer provide for the construction or improvement of any bridges or culverts required by the drainage works crossing any public road and it goes on to say that he shall apportion "as appears just" the cost between the drainage works and the municipality having jurisdiction over the road. While no mention is made of either the Department of Highways or the County system, the section does refer to "drainage works crossing any public road" and, certainly, it has been the practice for a great many years to deal with all roads in the same manner, regardless of who may have jurisdiction over them.

Subsection 3 deals with a particular case where a municipality passes a bylaw assuming all or a specific part of the cost of the crossings and where such a bylaw exists, there does not appear to be any problem. Rather, the difficulties arise where there is no bylaw, and in connection with County Roads and King's Highways.

It seems to me that the key to the whole problem lies in the words "apportion as appears just" contained in Subsection 2 and this, of

course, goes back to my earlier remark that the ultimate test for an assessment is "Is it fair to all concerned?"

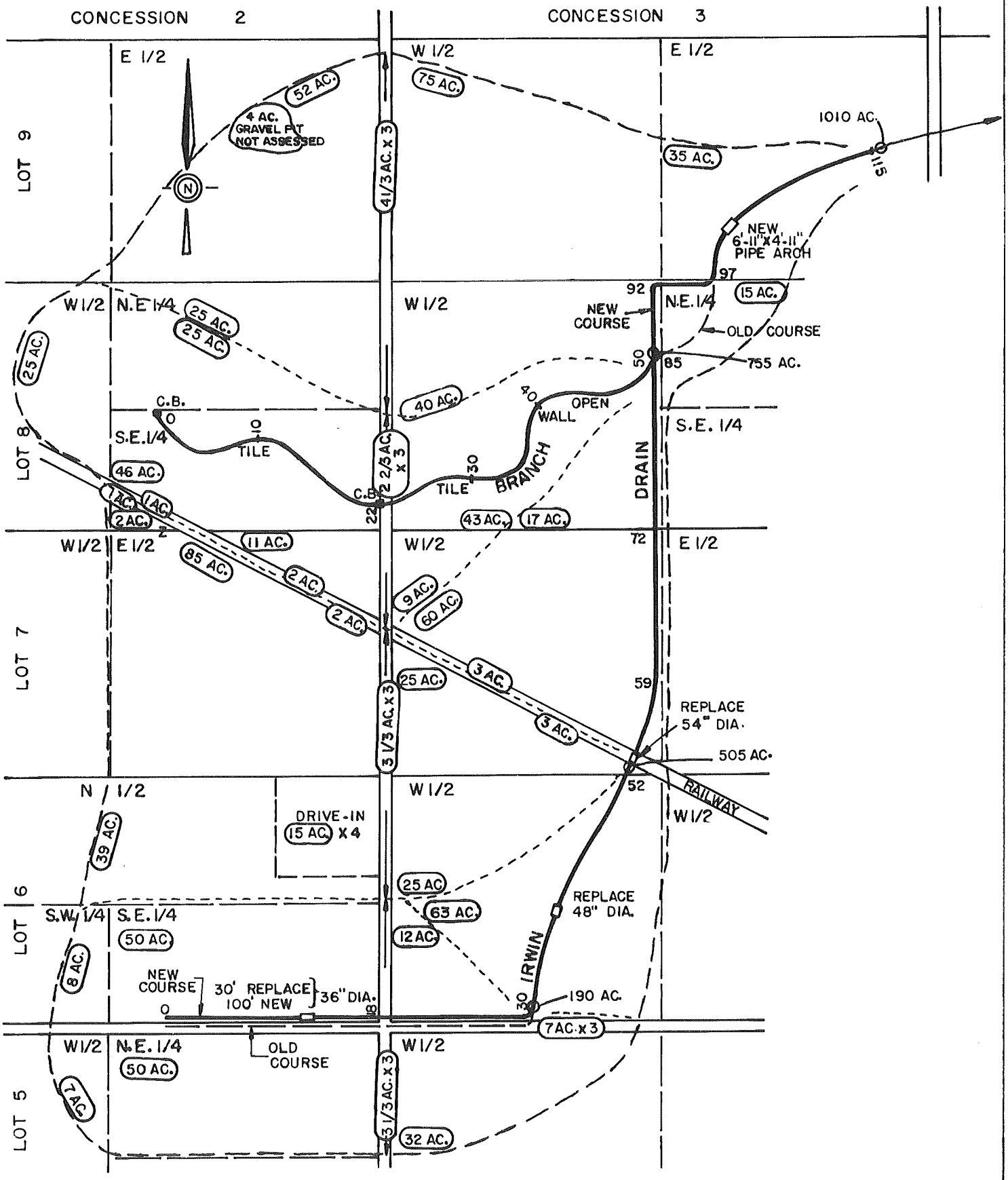
Over the years, it has happened very frequently that the construction, repair or improvement of a municipal drain has coincided with the need to replace a road bridge or culvert and the road authority has usually been quite prepared to assume the entire expense of this replacement. A great many of the old structures have now been replaced, however, and very often the sizes and depths of the new structures have been determined in consultation with the municipal council and adjoining owners. It is understandable that the road authority becomes somewhat upset, under these circumstances, when an Engineer brings forward a report providing that the relatively new road structure be torn out and a larger or deeper one installed at the road's expense, in order to accommodate a larger or deeper drain. In this situation, what is "just" or "fair"? Can the drainage area say to the road "Get out of our way, we take precedence over you" or can the road say to the drainage area "I'm here first and if you want to cross you will have to pay"? Because of the increasing cost of road construction and road crossings this matter is receiving more and more attention all the time. I submit to you that there is no real rule that can be applied in every case but, rather, the Engineer must use his very best judgement. As Mr. Steele pointed out, when we, as Engineers, undertake work under The Drainage Act, we do so as semi-judicial officers and this places on us an obligation that we must discharge to the very best of our ability.

Up until now we have been discussing laws, generalities, rules, and so on and many of these have been rather abstract. Let us turn now to some specifics and by examining the example I have prepared, perhaps we can see how one might go about the actual process of Distributing the Cost of a drainage works.

AN EXAMPLE OF DISTRIBUTING THE ESTIMATED COST OF A DRAINAGE WORKS UNDER THE DRAINAGE ACT, 1962-63

The Irwin Drain and Branch is a purely imaginary drain that has been developed solely for the purpose of illustrating as many different situations as possible that one is likely to encounter in distributing the cost of a drainage works. As a result, there are certain things about this drain and the drainage area that are not compatible with nature and it may be that some of the estimates of cost are not as realistic as they should be, but I would ask you to keep in mind that the point of this exercise is to distribute the cost and I therefore hope you will refrain from being too critical of some of these other matters which may not ring quite true.

An important part of making any drainage assessment, of course, is the examination of the property on the ground, but in the example before us, of course, we cannot do this. As a result, when we look at a parcel of land, you may visualize one thing while I visualize another and



DRAIN LOCATION & WATERSHEDS

SCALE : 1" = 1000'

(1)

this may prove confusing to all of us. However, let us restrict ourselves today to the mechanics of the operation, keeping in mind that in actual practice, these mechanical operations must always be subject to the individual Engineer's judgement, based on his experience and on his examination of the situation on the ground.

In order that we may all bring ourthoughts as close together as possible, there are certain basic facts that must be laid down before we can even start. Generally, these have to do with the things that the Engineer would discover in the course of his investigation. In the case before us, let us make the following assumptions:

A. The Township has:

1. A properly signed petition for drainage of the SE$\frac{1}{4}$, part of the NE$\frac{1}{4}$ and the east part of the W$\frac{1}{2}$, Lot 8, Concession 2.

2. A request for the repair and improvement of the Irwin Drain.

B. Instructions to Engineer:

1. Make an examination of the area described in the petition and prepare a report in response to it, under Section 3.

2. Make an examination and prepare a report for the repair and improvement of the Irwin Drain under Sections 48 and 52.

C. Examination of Records:

1. There is no existing Municipal Drain serving the lands described in the petition.

2. The Irwin Drain is an open drain constructed under the Municipal Drainage Act in 1937, beginning on the 5-6 Sideroad in the E$\frac{1}{2}$, Concession 2, and continuing easterly and northerly to just north of the centre of Lot 8, where it empties into a natural run going northeasterly.

3. The watershed of the Irwin Drain is as shown in Lots 5, 6 and 7.

D. Examination on the Ground Shows:

1. The land is rather flat south of the railway but a bit rolling north of it. The natural fall is in a northeasterly direction.

2. The Irwin Drain is now 2$\frac{1}{2}$ feet to 3 feet deep throughout its length and the natural run in the E$\frac{1}{2}$ of Concession 3 is a similar size.

3. A natural run on the $E\frac{1}{2}$ of Lot 8, Concession 2, meanders across a field under cultivation. A small ditch 2 feet deep winds across the $W\frac{1}{2}$ of Lot 8, Concession 3. This ditch is grown up with some scattered brush. The north part of the $W\frac{1}{2}$ of Lot 8, Concession 3, is pasture while the south part is cultivated.

4. The open ditch on the Sideroad is close to the travelled road and should be moved off.

5. There is a gravel pit with about 12 feet of water on the $E\frac{1}{2}$ of Lot 9, Concession 2.

6. There is a Drive-in Theatre on the $N\frac{1}{2}$ of Lot 6, Concession 2. The ground is well graded, gravelled and drained to a private ditch running easterly along the line between Lots 6 and 7.

7. About 3/4 acres of land are cut off by the drain at the southeast corner of the $W\frac{1}{2}$ of Lot 7, Concession 3.

8. About 6 acres of land are cut off at the northwest corner of the $NE\frac{1}{4}$ of Lot 8, Concession 3.

9. The work will probably have to be continued downstream most of the way across the $E\frac{1}{2}$ of Lot 9, Concession 3.

10. The total watershed of the whole drainage area is as shown by the broken line on the accompanying plan and the interior watersheds are shown by dotted lines. The acres affected in each parcel are surrounded by an ellipse.

11. The land is used for general farming (except for the Drive-In) and all of it can be reasonably well drained given a suitable outlet. The soil is clay loam and will be reasonably productive.

E. Discussion with the Owners and Township Representatives:

1. The owners petitioning want sufficient depth to permit tiling.

2. The owners of the $SE\frac{1}{4}$, Lot 8, Concession 2, and the $W\frac{1}{2}$, Lot 8, Concession 3, do not want an open ditch meandering across their cultivated fields, but there is no objection to an open ditch in the pasture area on the north part of the $W\frac{1}{2}$, Lot 8, Concession 3.

3. The road north of the railway is badly in need of drainage.

4. The Township Road Superintendent agrees that the open ditch on the Sideroad should not be deepened on the Road Allowance and is agreeable to the suggestion that it be moved off onto adjoining farm lands.

5. The owner of the NE$\frac{1}{4}$, Lot 8, Concession 3, would like to be rid of the ditch which cuts across his corner and is prepared to pay a reasonable price for relocating it along the line fences. The land along the fences is not much higher than along the course of the ditch so this appears practical.

6. The owner of the E$\frac{1}{2}$ of Lot 9, Concession 3, has no culvert or bridge and is driving through the ditch. He is planning to use the land east of the ditch more extensively and would like a bridge or culvert.

7. The owners appear quite serious about proceeding with both the new construction and the repair and improvement.

8. The railway is not interested in installing the culvert beneath its tracks and prefers that the Township carry out this part of the project along with the rest of the work on the drain.

9. The Township Road Superintendent will supply the necessary pipe to replace the old culvert where the open ditch crosses the Concession Road, but he does not choose to supply the pipe required to be installed across the lawn on the SE$\frac{1}{4}$, Lot 6, Concession 2.

F. Engineering Recommendations:

1. Since the owners are serious about proceeding with the work, and since the open ditch in the E$\frac{1}{2}$ of Concession 3 must be deepened to provide an outlet for the tile, as well as for the Irwin Drain, proceed with both the new construction and the repair and improvement under one report. This saves considerable duplication and cost but may not always be an advisable procedure.

2. In response to the petition, install tile and two catch basins through the cultivated area with an open ditch in the pasture on the W$\frac{1}{2}$ of Lot 8, Concession 3. The tile will be ten inches to 14 inches in diameter.

3. Deepen the existing drain by amounts varying from one foot to 1$\frac{1}{2}$ feet and continue the work downstream to Station 115 to obtain a sufficient outlet.

4. Move the existing drain off the Road Allowance between Lots 5 and 6 and relocate it on the adjoining farm lands to the north.

G. Culvert Data from Survey and Calculations:

1. Station 12 - Existing 30 inch pipe is too small. Should be 36 inches in diameter. The house is only 60 feet from the road limit so piping is required across the lawn.

Thirty feet of access culvert and 100 feet of lawn piping produce a total length of 130 feet.

2. Station 18 - The Township will supply a 42 inch C.S.P. for installation at the Concession Road.

3. Station 39 - The existing wooden bridge is falling in. Replace with a 48 inch C.S.P. 30 feet long.

4. Station 53 - The existing 36 inch concrete culvert is too small and too high. Replace with a 54 inch C.S.P. 48 feet long.

5. Station 100 - There is now no culvert or bridge but the owner is driving through the drain. Provide a new 6' 11" x 4' 11" pipe arch 30 feet long.

(The access culvert and lawn piping are provided in accordance with Section 8 (4), the culvert for the Concession Road is provided in accordance with a Bylaw passed under Section 8 (3) and the 2 farm culverts and the railway culvert are provided in accordance with Section 8 (5)).

Much of this background information is shown on Drawing 1 labelled "Drain Location and Watersheds."

Allowances

Since we have been discussing the matter of allowances, it seemed that it might be helpful if we were to take a few minutes to look at the calculation of some typical ones. These are shown on D awing 2 entitled "Allowances" and they were arrived at in the following manner:

D. Damages - Section 8 (1)

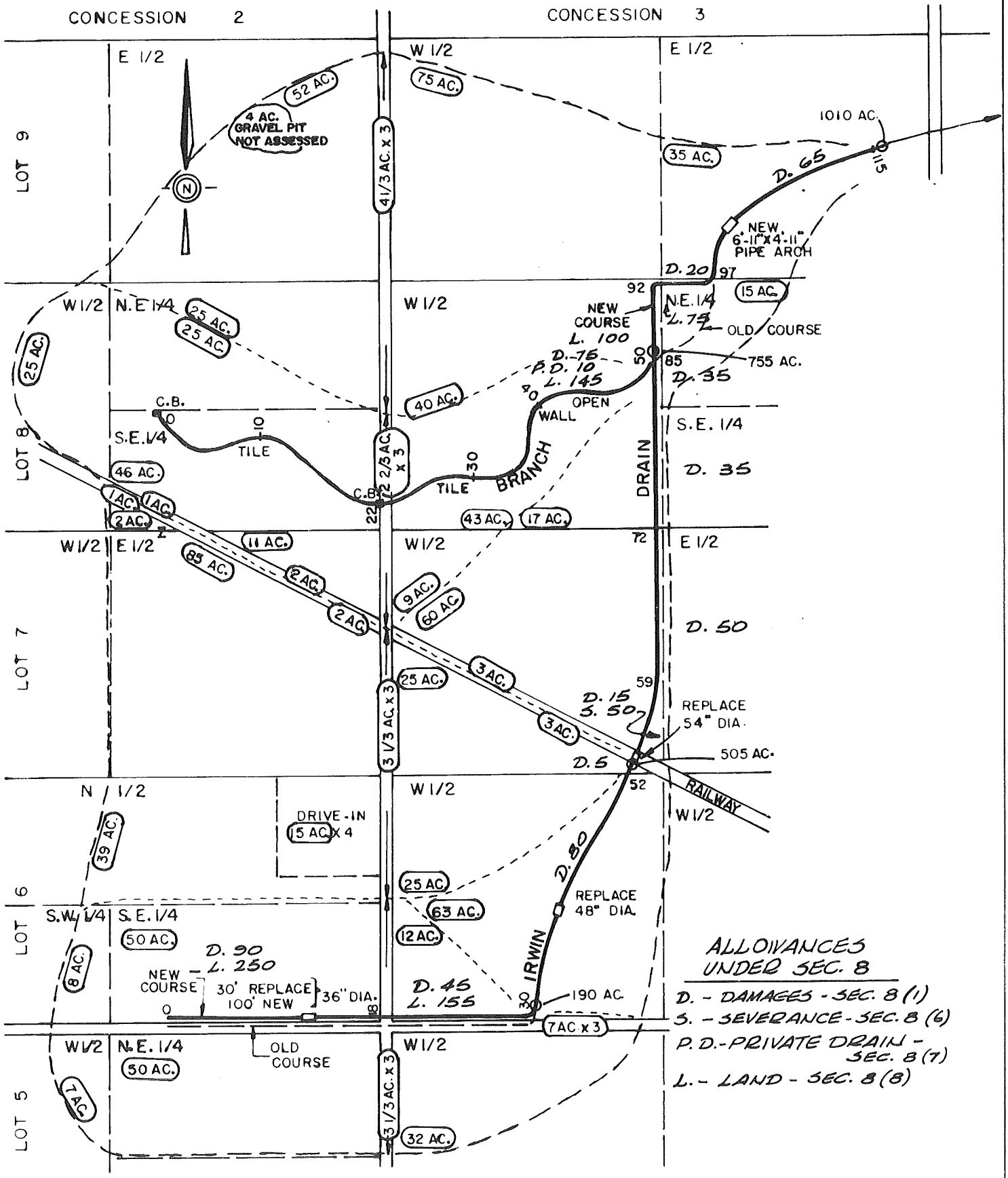
Average cross-sectional area of excavation - 15 square feet.
Spread this over 30 feet - Area covered, per 100 running feet of drain = 30 x 100 = 3000 square feet.

Station 0 to 18 - allow \$70/Ac. = $\frac{70 \times 3000}{43560}$ = \$4.80, say \$5.00 per stake.

Station 18 to 115 is generally pasture and hay in disposal area so allow at \$50/Ac. = \$3.50 per stake.
Branch - Open Ditch Sta. 40 to 50 has twice as much excavation per foot so allow \$7.00 per stake.

S. Severance - Section 8 (6)

SE corner $W\frac{1}{2}$, Lot 7, Concession 3.
3/4 acre severed but allowance was paid for this at time of construction. Ditch will be deepened about 15 inches.



ALLOWANCES UNDER SEC. 8

D. - DAMAGES - SEC. 8 (1)
S. - SEVERANCE - SEC. 8 (6)
P.D. - PRIVATE DRAIN - SEC. 8 (7)
L. - LAND - SEC. 8 (8)

ALLOWANCES

SCALE : 1" = 1000'

If the owner built a bridge the extra depth and width might increase the cost by $50, so allow $50.

$W\frac{1}{2}$, Lot 8, Concession 3.
Open ditch part of Branch severs a corner of the pasture but the owner can reach this by crossing over the end of the tile so I elected not to allow for severance.

P.D. Private Drain - Section 8 (7)

Existing channel on $E\frac{1}{2}$, Lot 9, Concession 3 is natural, or at least no one lays claim to it, so no allowance.
Branch - Station 40 to 50.
There is a small open ditch with some clumps of brush. Contractor will give little if any credit for this, so allowance of $10 is nominal.

L. Land - Section 8 (8)

Land sells for about $225 to $250 per acre, so an allowance of $300 per acre seems fair.
Width of strip required for ditch, including headlands will be about 20 feet. From this the area can be calculated in each location where land is required, and an allowance made.
At the open ditch part of the Branch the existing ditch uses up a strip about 7 feet or 8 feet wide and it might be argued that the owner should be paid only for the extra width required. I allowed for the full width of the strip since, presumably, he had never been paid before and he will have a fairly large ditch across the corner of his field.

To arrive at a cost to be distributed, there is no point in just picking a figure from the air since obviously it is quite important to know what work is being done and how much money will therefore have to be spent on each part of the drain. The estimated cost of this imaginary drainage work, then, is as follows:

ESTIMATED COST

Main drain:		
Excavation	$4400	
Installing pipes and culvers (except Rly.)	465	
Brushing	590	
Railway crossing	6000	
Supplying culverts and piping	1970	
Allowances	1070	$14,495
Branch:		
4000 lineal ft.of 10" & 14" tile drain	5900	
2 catch basins and outlet wall	600	
Excavation and brushing open outlet	500	
Allowances	230	$ 7,230
Incidentals - Engineering, Bylaw, Clerk's fees		2,700
Total estimated cost		$24,425

As we discussed earlier, the first step in distributing the cost is to break it down and determine the total cost of each section of drain. This has been done on Drawing 3 headed "Division of Cost." As you can see on that drawing, the Main Drain has been broken into four convenient sections. One section is the part being moved off the road, a second section is from the Sideroad to the south end of the railway culvert, a third section is from the south end of the railway culvert to the point at which the Branch enters and the fourth section is from there to the outlet. The Branch is broken into three sections. One section is from the head of the drain to the west side of the Road Allowance. The second section is from the west side of the Road Allowance to the outlet end of the tile and the third section is the open part of the Branch.

The actual breakdown is carried out as shown in the following table. In the case of the Main Drain the work under the heading "Drain" includes excavation, installing pipes and culverts and brushing, while the work under the heading "Culverts" includes the Railway crossing and the supply of the culverts and piping. In the case of the Branch, the work under the heading "Drain" includes both the tile drain and the open outlet.

BREAKDOWN OF ESTIMATED COST

Main Drain

Section	Drain	Culverts	Allowances	Subtotal	Incidentals	Total
0 - 30	1775	750	540	3065	310	3375
30 - 53	750	320	85	1155	170	1325
53 - 85	890	6000	160	7050	735	7785
85 -115	2040	900	285	3225	395	3620
	5455	7970	1070	14495	1610	16105

Branch

Section	Drain	Basins & Wall	Allowances	Subtotal	Incidentals	Total
0 - 22½	2850	400		3250	485	3735
22½- 40	3050	-	-	3050	460	3510
40 - 50	500	200	230	930	145	1075
	6400	600	230	7230	1090	8320

In addition to the work being carried out purely and simply for "Drainage Purposes" there are certain extra things that are being done and these extras have caused an increase in the cost of the work. In order that these extras may be properly considered in making the assessments, the amount of increase that each extra causes has to be determined. This is done in the following manner:

Section	Due to		Amount
0 - 30	Moving off road:		
	Extra excavation	1075	
	Lawn piping	585	
	Allowances	405	
	Incidentals	160	2,225
53 - 85	Railway Culvert:		
	Culvert and installation	6000	
	Incidentals	580	
	Subtract 50' of open ditch	- 10	6,570
85 -115	Relocation of Part:		
	Extra excavation	1240	
	Allowances	185	
	Incidentals	125	1,550
	Total increased cost for Special Purposes		$10,345

It should be noted in the above calculations that in dealing with the railway culvert, we were interested in arriving at "the increase of cost of the work caused by the construction and operation of the "Railway". We have therefore taken the cost of the culvert and its installation and added to this the extra engineering, supervision, etc. involved in this installation. We then subtracted what it would have cost to dig this piece of drain as an open ditch if the railway were not there, in order to arrive at the increase in cost.

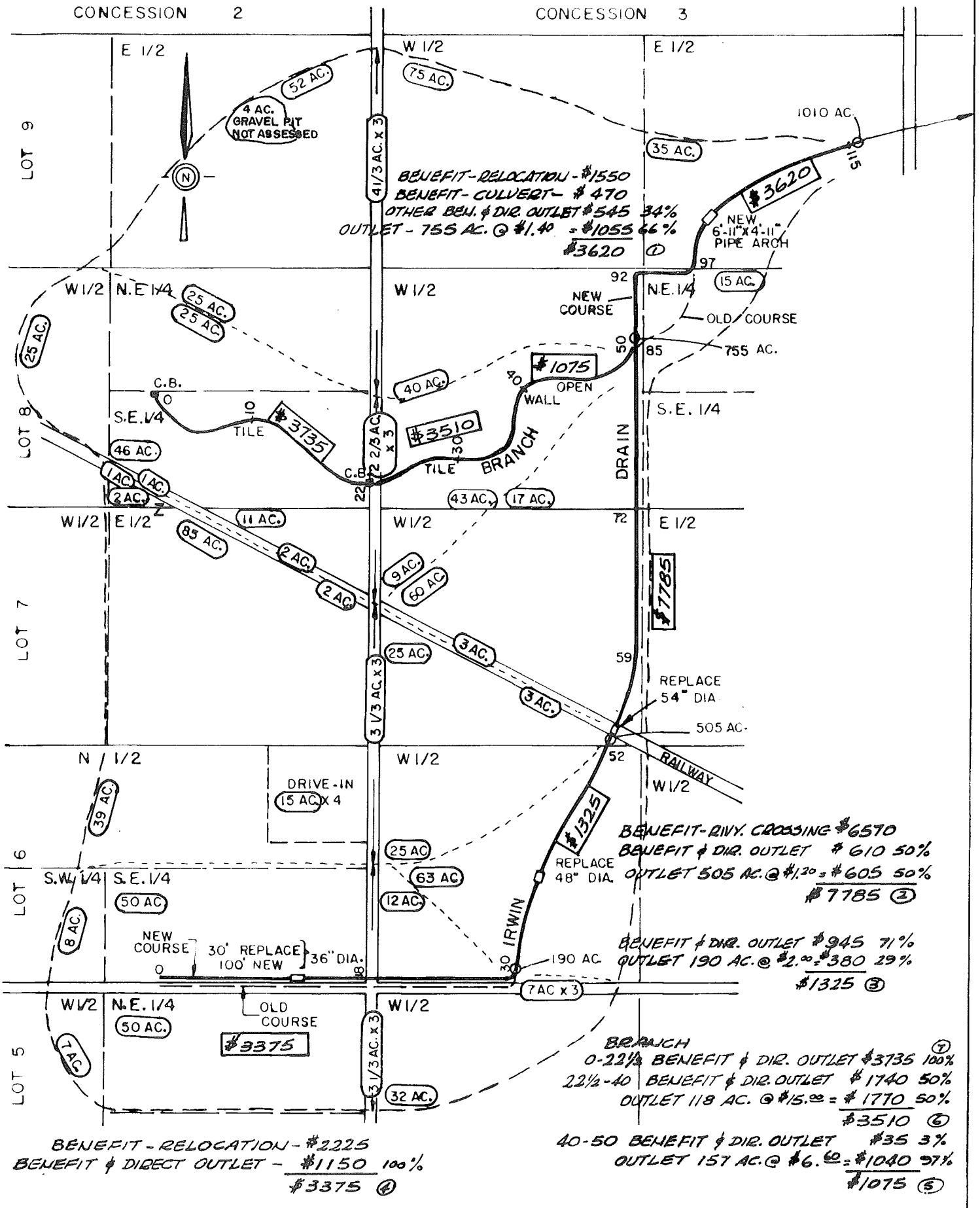
Perhaps at this point we should consider two terms that I have developed for my own use and which I will be using from time to time. So that we will all understand what I mean when I use them, I should like to define them as follows:

"Equivalent Acres" is the number of acres obtained by multiplying actual acres in a parcel by a factor that recognises the volume and rate of flow of the water artificially caused to flow from the parcel under consideration, in comparison with the volume and rate of flow of water artificially caused to flow from the other parcels in the watershed.

"Direct Outlet" is the outlet assessment against the lands directly abutting the section of drain under consideration, as distinct from the usual outlet assessment against the upstream lands.

ACREAGES ASSESSED

At this point the Equivalent Acreage of each parcel should be determined and written on the working plan, if this has not already been done. As shown on our drawing, this can be done either by showing the actual



TOTAL ESTIMATED COST $ 24,425

DIVISION OF COST (3)

SCALE : 1" = 1000'

acreage and the applicable factor (as on the roads and the Drive-In property) or by showing the net acreage (as in the case on the E½ of Lot 9, Concession 2. where the 4 acres of the gravel pit has already been subtracted from the 56 acres in the watershed to arrive at the net assessable area of 52 acres). Probably, it's a good idea to show both for future reference. This method of using "Equivalent Acres" is a handy tool since it allows the Engineer to recognize fully in accordance with Section 16 (3) that "the volume and rate of flow of the water artificially caused to flow" may be different for different parcels, while, at the same time, it brings everything to a common denominator and greatly simplifies the mathematics. To apply this idea, one simply chooses a parcel of land that is most nearly representative of most of the land in the watershed and assigns to this a factor of 1. Every other parcel can then be compared to this standard and if the volume and rate of flow of water artificially caused to flow is greater than for the standard parcel, the factor would be correspondingly greater than 1, while if the volume and rate of flow is less than for the standard parcel, the factor would be less than 1. In our example, the roads have large impervious areas and are well ditched and a factor of 3 has been used in comparing them with ordinary farm land. The Drive-In property is also well-drained and a larger percentage is impervious than in the case of the roads and the factor chosen here was 4. The gravel pit, of course, cannot be drained at all and has therefore been given a factor of 0.

Some parcels, such as the W½ of Lot 6, Concession 3 may drain in several different directions and the acres flowing each way must be determined and shown on the plan. When this is done, the number of "Equivalent Acres" within each of the interior watersheds is calculated and, from this, the number of acres which uses each section of drain is determined and shown on the plan, beginning at the upstream end and continuing downstream to the outlet. In our example, we see that there are 190 Equivalent Acres using the drain at Station 30 and these acres will use all of the drain lying between Station 30 and Station 53. At Station 53, the number of Equivalent Acres using the drain has increased to 505 and this is the number that will use all of the drain from Station 53 to Station 85. At Station 85, the number of Equivalent Acres has increased further to 755, some of which are on the Main Drain and some on the Branch and this is the number of acres that will use the entire section of drain from Station 85 to the outlet at Station 115. Similarly, the number of acres using each section on the Branch is calculated and written on the plan.

DIVISION OF COST OF EACH SECTION INTO BENEFIT AND OUTLET

After the total cost has been broken down and the cost of each section determined, each of these section costs must be further broken down to determine how much of the cost will be assessed as "Benefit" and how much as "Outlet." This is done in the following manner, beginning at the outlet of the drain and working upstream toward the head. The final results are shown in summary form on Drawing 3.

Section (1) -	Total Cost		$3620
	Special - Relocation	$1550	
	½ Cost of culvert	470	2020
	Remainder to be assessed		1600
	Should be about 1/3 benefit and 2/3 outlet		
	Equivalent acres draining - 755 acres		
	At $1.40 per acre this will produce		$1055
	Remaining for Benefit and Direct Outlet		545
Section (2) -	Total Cost		$7785
	Special - Railway culvert		6570
	Remainder to be assessed		$1215
	Should be about ½ benefit and ½ outlet		
	Equivalent acres draining - 505 acres		
	At $1.20 per acre this will produce		$605
	Remaining for Benefit and Direct Outlet		$610
Section (3) -	Total Cost		$1325
	No Special		
	Should be between 2/3 and 3/4 benefit, say 70% benefit and 30% outlet.		
	Equivalent acres draining - 190 acres		
	At $2.00 per acre this will produce		$380
	Remaining for Benefit and Direct Outlet		$945
Section (4) -	Total Cost		$3375
	Special - Moving off road		2225
	Remaining to be assessed		$1150
	No upstream lands so assess 100% Benefit and Direct Outlet		1150
Section (5) -	Total Cost		$1075
	Almost entirely provided for tile		
	Equivalent acres draining - 157 acres		
	At $6.60 per acre this will produce		$1040
	Remaining for Benefit and Direct Outlet		$ 35
Section (6) -	Total Cost		$3510
	Tile will eliminate existing open ditch so benefit large - perhaps 50%.		
	Equivalent acres draining - 118 acres		
	At $15 per acre this will produce		$1770
	Remaining for Benefit and Direct Outlet		$1740

Section (7) - No upstream lands so assess
100% Benefit and Direct Outlet $3375

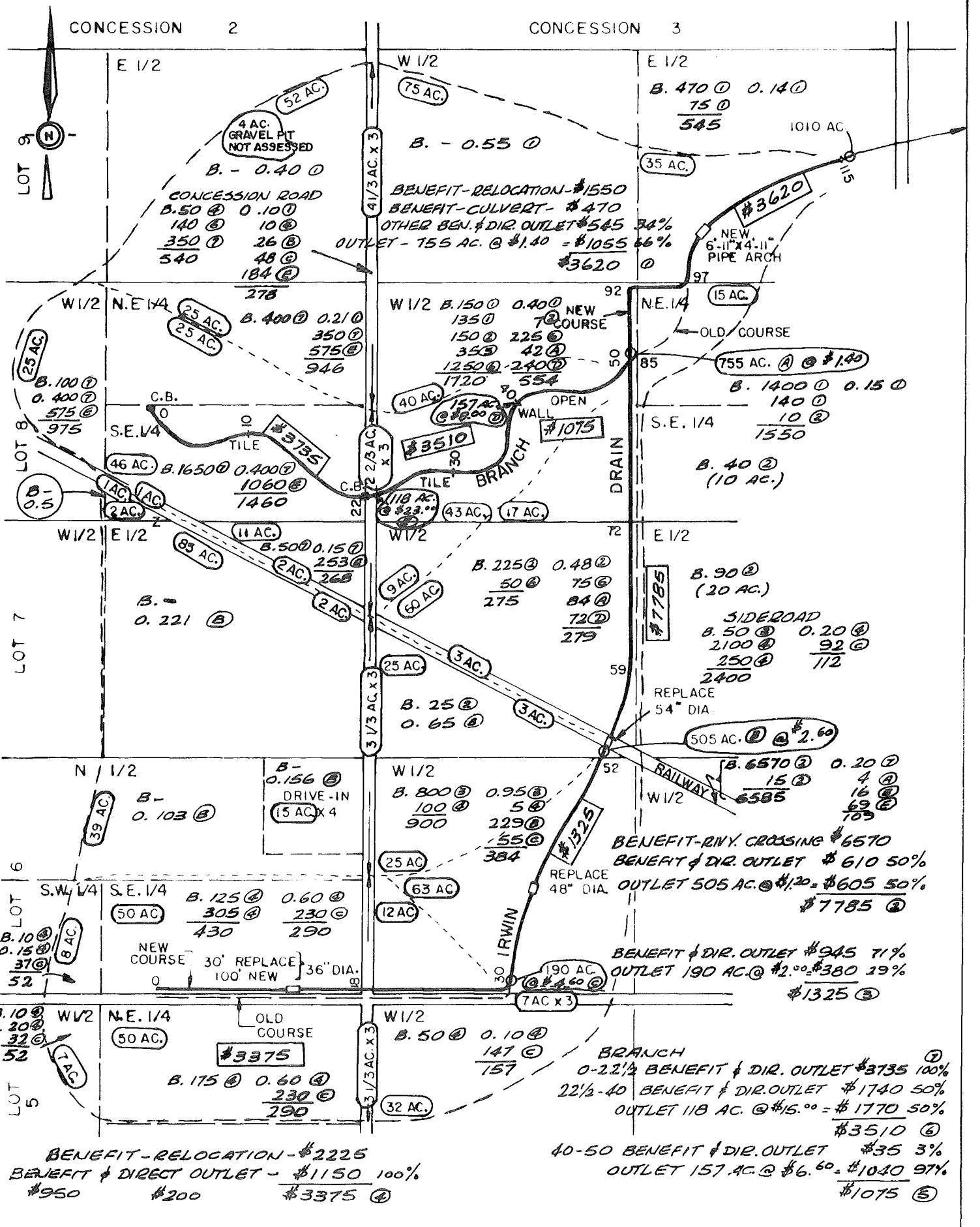
ASSESSMENT OF BENEFIT AND OUTLET AGAINST EACH PROPERTY

The final result of this is shown on Drawing 4 entitled "Assessment of Cost." While it may appear quite complicated at first glance, I think you will agree with me that if we deal with one section and one property at a time, each item follows along quite logically and the whole breakdown falls into place. This should be done beginning with the downstream section and continuing upstream to the head of the work. As each amount is determined, I like to write it on the plan, right on the property or as near to it as I can and this then forms a picture that helps me visualize how the costs are working out as I go along. It is essential that all of the cost of Section 1 be accounted for before proceeding to Section 2, but there is no set order for dealing with the various properties that contribute to the cost of Section 1. As a matter of practice, I prefer to deal with the properties furthest away and then work down to the ones closest to the drain.

The actual calculations and many of the reasons are set out in the following table in the hope that the method, if not the reasons themselves may be hlpful.

Section (1)

Relocation of $1550	NE¼ Lot 8 will benefit most from elimination of the open ditch but W½ will have better drainage. Divide $1400 and $150.	
½ cost of culvert	$470 assess to E½ Lot 9 where culvert is installed.	
Direct Outlet	E½ Lot 9, Con.3	- 35 acres use ¼ to 1/3 length of section. Charge ¼ to 1/3 of $1.40 = 40¢ per acre = $14
	W½ Lot 9, Con. 3	75 acres use ½ length of section. Charge about ½ of $1.40, say 70¢ per acre = $55 (about).
	2-3 Con. Road	-4-1/3 acres x 3 = 13 acres at 77¢ = $10
	E½ Lot 9,Con.2	-Similarly, say 75¢ on 56-4 = 52 acres = $40 (about).
	NE¼ Lot 8,Con.2	-Part of NE 25 ac. enters slightly upstream from where E½ Lot 9 enters so charge 85¢, say, on 25 ac. = $21.
	W½ Lot 8,Con. 3	-N 40 ac. uses over 2/3 of length so charge 2/3 of $1.40, say $1 per acre = $40
	NE¼ Lot 8, Con.2	-Similarly $1 per acre on 15 acres = $15
	Total Direct Outlet = $195	



TOTAL ESTIMATED COST $ 24,425

ASSESSMENT OF COST ④

SCALE : 1" = 1000'

Benefit and Direct Outlet previously determined to be $545
Drainage Benefit Assessment = 545 - 195 = $350.

$W\frac{1}{2}$ Lot 9 -No benefit since water enters about Station 100.

$W\frac{1}{2}$ 8, $NE\frac{1}{4}$ 8, $E\frac{1}{2}$ 9 -Get drainage benefit in ratio of about 2:2:1, with $W\frac{1}{2}$ 8 slightly lower and $E\frac{1}{2}$ 9 slightly higher. Divide $135, $140, $75 and assess these as benefit = $350

Outlet. Indicate on plan that all land entering drain at Station 85 or above will pay for outlet at rate of $1.40 per Equivalent Acre (designated A).

Section (2)

Railway Crossing $6570. Assess against Railway (Section 273 of Railway Act.

Direct Outlet. $W\frac{1}{2}$ Lot 8. 17 Ac. use 1/3 of length of section. Charge 1/3 of $1.20 = 40¢ per ac. = $7.
$W\frac{1}{2}$ Lot 7. 60 ac. use 2/3 of length of section. Charge 2/3 of $1.20 = 80¢ per ac. = $48.
Total Direct Outlet = $55.

Benefit and Direct Outlet previously determined to be $610.
Drainage Benefit Assessment = 610 - 55 = $555

About $\frac{1}{4}$ of the benefit will be the value of cut-off to the lands east of the Drain. $\frac{1}{4}$ of $555 = $140.

Divide this $90 on $E\frac{1}{2}$ Lot 7, $40 on $SE\frac{1}{4}$ Lot 8, and $10 on $NE\frac{1}{4}$ Lot 8, approximately on a frontage basis.

This leaves 555 - 140 = $415 for land in $W\frac{1}{2}$ Con.

Benefit to Railway is nominal, say $15

Benefit to Part $W\frac{1}{2}$ Lot 7 south of railway is greater than benefit to railway but only corner is affected.

Assess $25.

This leaves $375 to divide between Part $W\frac{1}{2}$ Lot 7 North of Railway (60 ac.) and SE corner $W\frac{1}{2}$ Lot 8 (17 ac.). On basis of length of drain on each, area of each and proximity of areas to drain, divide $225 and $150 respectively.

Outlet. Indicate on plan that all land entering drain at Station 53 or above will pay for Outlet at rate of:

For use of Section (1) - $1.40
For use of Section (2) - 1.20
Rate on upstream lands = 2.60 per Equivalent Acre.
designated (B))

Note that when this is applied to the farm part of $N\frac{1}{2}$ Lot 6, Con. 2, the resulting Outlet assessment is 39 x 2.60 = $103 but when applied to the drive-in theatre it is 15 x 4 = 60 Equivalent Acres x 2.60 = $156

Section (3)

Direct Outlet — W½ Lot 6, Con.3, 63 ac. use 3/4 of length of section.
Charge 3/4 of $2 -= $1.50 per ac. = $95

Benefit and Direct Outlet previously determined to be $945.
Drainage Benefit Assessment = 945 - 95 = $850

Sideroad will benefit from work on this section since it will let water away faster. Charge $50.

W½ Lot 6 will benefit from new culvert (installed cost about $400) and from 2200 lineal feet of drain through middle of 63 ac. parcel. Since 3/4 of cost of section is charged as Benefit, 3/4 of cost of culvert, or $300 is charged as benefit to farm. This leaves $500 which is a reasonable amount to charge for drainage Benefit alone; therefore, assess W½ Lot 6 $800 for Benefit.

Outlet. Indicate on plan that all land entering drain at Station 30 or above will pay for Outlet at rate of:

For use of Section (1) - $1.40
For use of Section (2) - 1.20
For use of Section (3) - 2.00
Rate on upstream lands per Equivalent Acre (designated (c)) = $4.60

Section (4)

Relocation $2225. SE¼ Lot 6, Con.2 will benefit from the elimination of an open ditch in front of the house, as a result of the lawn piping. Moving ditch onto lawn was for the good of the road, however, Installed cost of 100' of piping (not including access culvert) is about $650. Of this an assessment of $125 against the land for removal of the open ditch seems fair. Remainder of relocation cost, or $2100 assessed against Sideroad since the road alone benefits from moving the ditch off the Road Allowance.

Direct Outlet — Remaining cost of this section (3375 - 2225=$1150) is comparable to cost of Section (3) and land using all of Section (3) was assessed $2 per acre. Use similar rate of $2 or so for land using all of Section (4) and less for land using only part of section.
Total Direct Outlet = $200

Benefit and Direct Outlet previously determined to be $1150
Drainage Benefit Assessment = 1150 - 200 = $950

Sideroad adjoining drain will benefit about ¼ of this say $250.

Concession Road will benefit some (about the same as Sideroad benefited from Section (3)) say $50.

SW$\frac{1}{4}$ Lot 6 and W$\frac{1}{2}$ Lot 5 Con.2 will benefit nominal amounts only, say $10 each.

This leaves $630 for 4 parcels in E$\frac{1}{2}$ Con.2 and W$\frac{1}{2}$ Con.3 land

Land in E$\frac{1}{2}$ Con.2 has 1$\frac{1}{2}$ times the length of ditch available to connect into and about 4 times the are draining directly to the section. From knowledge of the ground, charge the land in E$\frac{1}{2}$ Con. 2 about 3 times the amount charged to W$\frac{1}{2}$ Con.3; i.e. assess W$\frac{1}{2}$ Con.3 for Benefit $\frac{1}{4}$ of $630 or, say $150 and E$\frac{1}{2}$ Con.2 the remainder or $480. Before land in Lot 5 can use the drain the owners will have to install road culverts to get their water across the Sideroad. Also the drain will take surface water directly from land in Lot 6 but the road will obstruct surface water from the land in Lot 5. Land in Lot 6 should pay more than equal areas in Lot 5 -- perhaps in the order of twice as much in Con. 3, but not quite twice in Con.2. In Con. 3 divide $150 for Benefit, $50 on W$\frac{1}{2}$ Lot 5 and $100 on W$\frac{1}{2}$ Lot 6.

In Con.2 divide $480 for benefit, $175 on NE$\frac{1}{4}$ Lot 5 and $305 on SE$\frac{1}{4}$ Lot 6.

Section (5)

Direct Outlet — Very small area drains directly to this section so omit assessment for Direct Outlet.

Drainage Benefit Assessment = $35.

W$\frac{1}{2}$ Lot 8 Con.3. This is the only parcel benefitting so asses whole $35 to this.

Outlet — Indicate on plan that all land entering at Station 40 of the Branch or above will pay for Outlet at rate of:

For use of Section (1) - $1.40

For use of Section (5) - 6.60

Rate on upstream lands = $8.00 per Equivalent Acre (designated (D))

Section (6)

Direct Outlet — W$\frac{1}{2}$ Lot 8, Con.3. 30 ac. use about $\frac{1}{2}$ of length of section. Charge $\frac{1}{2}$ of $15.00 = $7.50 per ac. = $225.

W$\frac{1}{2}$ Lot 7, Con.3. 9 ac. use slightly more than $\frac{1}{2}$ length of section. Charge, say $8.30 per ac. = $75.

Benefit and Direct Outlet previously determined to be $1740.

Drainage Benefit Assessment = 1740 - 300 = $1440

Road will benefit considerably by drainage provided by this section even if the work is not continued easterly across the road. Assess road 10% or $140.

$W\frac{1}{2}$ Lot 7, Con.3 will not benefit a great deal although work will dry up a wet corner of lot. Assess $50.

$W\frac{1}{2}$ Lot 8, Con.3 Assess remainder of $1250. Deeper and better drainage will be provided and open ditch eliminated so this is a reasonable figure.

Outlet — Indicate on plan that all land entering drain at Station $22\frac{1}{2}$ on Branch, or above, will pay for Outlet at rate of:

For use of Section(1)- $1.40
For use of Section(5)- 6.60
For use of Section(6)- 15.00

Rate on upstream lands = 23.00 per Equivalent Acre (designated (E))

Section (7)

Direct Outlet. — Total cost of Section (7) is slightly greater than total cost of Section (6). Land using all of Section 6 paid $15 per acre so charge land using all of Section 7, $16 per acre. Land using part of Section 6 is charged a proportionate rate producing a total Direct Outlet assessment on Section (6) of $1185.

Total cost of Section of $3735.

Drainage Benefit Assessment = 3735 - 1185 = $2550

$E\frac{1}{2}$ Lot 7, Con. 2 will not benefit a great deal but will get some good, especially at corner lot. Assess $50.

$W\frac{1}{2}$ Lot 8, Con.2 is 300' from head of drain but tile will provide underdrainage to general area. Also a facility will be available if the owner wishes to use it. Assess $100.

Con. Road. Installed cost of steel pipe under road and catch basin is about $400. Road should pay about 2/3 of this, or $275, plus about $75 for value of drainage provided for a total of $350.

$E\frac{1}{2}$ Lot 8, Con.2. Of $2550 total for Benefit, $2050 is left to charge against these two parcels. $SE\frac{1}{4}$ lot 8 has the whole of this section of drain located on it and has nearly twice the area draining that the $NE\frac{1}{4}$ has. The catch basin at the line fence will help both. Divide $2050 at 4 parts on $SE\frac{1}{4}$ to 1 part on $NE\frac{1}{4}$. This gives an assessment of $400, say, on $NE\frac{1}{4}$ and $1650 on $SE\frac{1}{4}$. This figure of $1650 seems reasonable for a main drain through the middle of the property and compares favourably with $1250 on $W\frac{1}{2}$ Lot 8, Con.3, which has shorter length, smaller area, and no catch basins.

Outlet Assessments (A) to (E) inclusive.
These rates are applied to the various areas concerned and the outlet assessments against each parcel written in, being careful to use Equivalent Acres.

Benefit and Outlet Asessments are totalled for each property and a Schedule of Assessment is prepared. This Schedule should show for each parcel the:

Concession
Lot or Part
Actual acres affected
Owner's name
Benefit Assessment
Outlet Assessment
Assessment for lateral drains (if any)

The Schedule of Assessment can take the form set out in The Drainage Act, 1962-63, in Form 4, or it can be set up using the headings of the "Application for a Grant" of the Department of Municipal Affairs. These headings distinguish the assessments against publicly and privately owned land and between land used for agricultural purposes and land not used for agriculture. In following this procedure, the engineer complies with Section 17 of the Act and he makes it easier for the Township Clerk to prepare the Application for Grant.

At this point, the total assessments can be determined and compared with the Estimate of Cost. If they do not agree, minor adjusting of the assessments should be carried out to bring them into balance.

As a further step, the Engineer should review the Benefit and Outlet Assessment against each property, comparing every one with every other one, to ensure that each property has been dealt with fairly as compared with every other property. If any unfairness appears, then this should be adjusted out until the Engineer is satisfied that all the assessments are fair and in balance, having in mind the conditions as they exist on the ground.
This done, the Engineer should take one more look over all of the assessments to ensure that in no case is the total assessment against a parcel (including both Benefit and Outlet Assessments) greater than the actual benefits (or value) to be derived by that parcel, because if it is greater, either the assessments are out of balance, or the report is open to attack under Section 35 of The Drainage Act, 1962-63. (Section 35 gives as a ground for appeal against the report "that the benefits to be derived from the drainage works are not commensurate with the estimated cost thereof").

As can be seen from this example, distributing the cost of a drain is not an exact science since many of the decisions are based entirely on the judgement and experience of the engineer making the distribution. In view of this, it is unreasonable to make any assessment in an amount less than an even dollar and, probably, it is unrealistic to distribute the cost in amounts less than multiples of $5. As can be seen from the example, all of the benefit assessments are in multiples of $5, although many of the outlet assessments are taken down to the nearest $1. The reason for this, of course, is that it is only by doing so that one can hope to have the total number of dollars assessed under the heading of Outlet work out to anywhere near the proper figure determined by the Division of Cost of Each Section.

There may be some who will say that the method followed in this example is much too complicated and time-consuming and they may well feel that they could distribute the cost into amounts that would be just as acceptable as those at which we have arrived. While this may be so, it is also true that without a definite method of distributing the cost, such as that illustrated, it is next to impossible to explain satisfactorily to either an owner or a Judge the reason for assessing a stated amount against a particular property.