Third Party Compensation

for Interbasin Transfers of Water in Texas:

Alternatives for Funding and Payment

Prepared for

Texas Water Development Board

by
Resource Economics, Inc.
Austin, Texas

July, 1999

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Resource Economics, Inc.
Austin, Texas
July 1999

EXECUTIVE SUMMARY

The Rationale for Compensation

Historically the water laws in the Western U.S. have protected the basin of origin from unreasonable transfers of its surface water supplies out of basin by reserving **water** for the area's ultimate requirements or providing for recapture in the event of future need. Texas has a system of basin of origin protections, although it has never "reserved" water for use in the basin of origin. A Texas Supreme Court ruling in 1966 (City of San Antonio v. Texas Water Commission) held that the Texas law prohibits interbasin transfers if the transfer would "prejudice any person or property" within the basin of origin; prejudice is to be determined by weighing the detriments to the basin of origin against the benefits of the diversion. Senate Bill 1 contains a "junior" water rights provision that makes the right to transfer water junior in priority to water rights granted before the time of the application for transfer. While there were historically good reasons for giving preference to the basin of origin, times have changed. The current conditions in Texas suggest that transfers be encouraged, rather than discouraged, through a program of compensation.

The need for policies that encourage interbasin transfers and transfers from low valued uses to higher valued uses is clear from events now occurring in Texas. One means of encouraging such exchanges is through solving one of the major problems with such exchanges, that of third party compensation. The current State Water Plan summarizes the current conditions:

> "Today, increasing relative scarcity and competition for available water, the high cost of new water supply development, and heightened environmental concerns make it difficult to marshal the public support needed to bring major new water development projects to fruition. Against this backdrop, Texas' population is projected to double over the next 50 years, and the water needs of its cities and industries are expected to correspondingly increase. Water is becoming evermore costly for Texans, and the lack of locally-available water supplies has prompted major urban areas to look to other regions in their search for water. At the same time, adequately providing for water needs of the environment has come to be recognized as an essential element of sound water planning and management."[1]

This study identifies alternative third-party compensation mechanisms and revenue sources and illustrates how they might be applied in three important Texas examples.[2] The compensation approach achieves the following important results.

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[1] Water for Texas: A Consensus-Based Update to the State Water Plan: Vol. II, Technical Planning Appendix, Texas Water Development Board, August 1997, p. 1-1.

[2] This study defines "mechanism" as the process, actions or steps that will achieve compensation of third parties for economic losses due to transfer of surface or groundwater from one basin to another. A third party is defined as any individual, business, or government in the basin of origin or the receiving basin that is economically affected by the transfer, but is not one of the two direct parties to the transfer. A

- Protection for the area or basin of origin will be preserved by requiring compensation to the basin of origin that is at least as valuable as the transferred water when third-party interests are included.
- Primary parties are compensated by the purchase price of the water or water right (if any), assuming the water is sold in a fair trade at arms length.
- The third parties to be compensated are those basin of origin residents and businesses that do, or will, benefit from the water to be transferred but do not have established rights to the water.
- Primary and third parties in the basin of origin will often be net gainers from an inter-basin transfer under the procedures outlined here because net income benefits in the receiving basin will be shared with the basin of origin.
- Basin of origin protection through compensation described in this report will encourage transfers that will often result in net economic gains for both the exporting and importing basins, as well as the Texas economy at large.

The guiding rule for identifying a full range of possible mechanisms for compensation considered in this study is as follows:

(1) the receiving basin, as a condition of the transfer, should replace the third-party income foregone (including the equivalent value of lost fish and wildlife) in the basin of origin; analysis of the potential income losses in regions that produce economic outputs that are competitive with those of the importing basin should be provided; [3]

(2) the receiving basin should share the net regional income gain with the basin of origin[4]; and

(3) the transfer should only occur if the net regional income gain due to the transfer for the set of regions in the aggregate (including the equivalent value of fish and wildlife changes) is positive, given all feasible alternatives to the transfer. This implies that a transfer should occur only if the transferred water, including the costs of transportation and payment for third-party income losses, is the lowest cost water available to the importing basin.

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mechanism may be a set of rules adopted by an existing agency of a state or local government, or an institution set up by the state legislature to carry out the functions of receipt of revenues and payment of compensation required as the result of approval of the transfer. In the case where the primary transaction is strictly among private parties, the mechanism may be a set of regulatory rules for how the private entities must behave in order to maintain the right to transfer water.

[3] This condition ignores payment of income compensation to regions whose economic production is competitive with that of the importing basin. Economic efficiency only requires that aggregate net benefits exceed aggregate costs, including the accounting for income losses to competing regions. Actual payment to third parties in the exporting basin is recommended here for equity purposes and to encourage transfers, but actual compensation to competing regions is not recommended here, for practical reasons.

[4] The examples presented in this report include recreation and fish and wildlife values, as measured by a willingness to pay calculation, in the income value to be shared among the regions.

Such a three-part rule would not by it self discourage any beneficial transfer and would often encourage it. The rule will satisfy several important criteria.

- The guiding rule is workable without (2), but without it does not provide equity or incentives for transfers.
- The three-part guiding rule is economically efficient because it encourages a scarce natural resource to be put to its highest valued use. The rule is equitable because the primary losers to a transfer are fully compensated, and receive a proportional share of any net income gains of the transfer.[5]
- The three-part guiding rule is consistent with the Texas Supreme Court ruling in 1966 in City of San Antonio v. Texas Water Commission. The court held that the Texas law prohibits interbasin transfers if the transfer would "prejudice any person or property" within the basin of origin; prejudice is to be determined by weighing the detriments to the basin of origin against the benefits of the diversion. Compensation based on the income value of water will satisfy the Supreme Court's ruling.
- The three-part rule would require repeal of the SB 1 provision that makes transferred water rights junior to rights granted before the time of application for transfer, which does discourage some beneficial transfers.

Three classes of mechanisms will, to varying degrees, achieve the objective of providing third party compensation as defined above.

- Class A alternatives will achieve payment of income foregone and the sharing of net regional income gains.
- Class B alternatives will achieve payment of only income foregone.
- Class C alternatives will achieve some form of public and/or private compensation in the form of in-kind payments, cost sharing on public projects or subsidies that approximate the size of the basin income foregone, but ignores the sharing of net regional income.

The above three types of payment are identified in this study for several reasons, explained in more detail in Chapter III. Class C alternatives are included because they are the most common in the historical cases, not only in Texas, but also in other states. While this type of payment is better than no third party payment at all, it does not do a very good job of matching payments with income that is given up because of the transfer. Class B alternatives are included because they match payments with income that is given up, but do not go the extra step of providing net regional income sharing, and are therefore less complicated to administer. As a general matter this alternative will be superior to Class C alternatives, but inferior to Class A. Class A alternatives are included because they most clearly satisfy the three-part rule. Class C alternatives will require less change in legislation and will be less of an administrative burden to implement. The differences among the three alternatives are evident in the following historical examples.

[5] By definition the direct seller of transferred water is not among the losers.

Examples of Third-party Compensation in Texas and Other States

The idea of compensation in exchange for opportunities foregone to enhance economic gain for the whole is not new. There are notable examples of applying such mechanisms in the transfer of water in the West, as well as the exercise of such practices in other natural resource allocation problems.[6]

- The Lake Fork project in northeast Texas involved a long term contract to have the City of Dallas (originally, Texas Utilities) make debt service payments of approximately $10 million per year to repay the bonds issued by the Sabine River Authority (SRA) to construct the project, in exchange for the out-of-basin transfer of 120,000 acre-feet of water per year. This is a Class C Compensation example.
- The Lake Tawakoni project in northeast Texas involved the sale of a water right to the firm yield of the reservoir in exchange for payment from the City of Dallas for the bond payments to construct the project. This is a Class C Compensation example.
- A private sector case in Texas involves a program of payment to impacted parties resulting from extensive groundwater pumping to "de-water" a lignite mine by Alcoa in Milam County. This is a Class C type compensation if water supplies are replaced; it is a Class B type if income payments are made.
- An interbasin transfer involving in-kind compensation is that of the so-called "Devers Case". Devers Canal System, as a division of Trinity Water Resource, Inc., in bankruptcy proceedings in the early 1990s sold its assets, including its Trinity River Basin water rights to San Jacinto River Authority for Houston area water supply, thus transferring water rights from the Trinity River Basin to the San Jacinto Basin. Under protest by irrigators who depend on Trinity River water from Devers Canal System, agreements were reached to retain water flows for irrigation use in the Trinity. This is a Class C Compensation example.
- A Nevada case involved a direct payment (cash) to an Indian nation to compensate for the loss of water related benefits resulting from an intrabasin transfer. The payment of $40 million was made from the Federal government to fund an economic development program in the area of origin. Another $43 million payment was made to fund the purchase of land and water rights to consolidate tribal holdings within the reservation. This project may be a Class A Compensation example since payment exceeded that needed to only replace the water through some in-kind project.
- Another case is a well known Colorado interbasin transfer statute that has the practical effect of requiring the importing region to build water storage facilities in the basin of

[6] Water is somewhat unique among natural resources concerning the need for third party compensation to achieve economic efficiency in that other resources traded in ordinary ways as market commodities do not have third parties; the only significant parties affected by a trade are the two primary parties. In the case of surface waters there are usually downstream parties able to make beneficial use of the water returned to the river by primary upstream users. They are adversely affected by the upstream user's agreement to transfer the water out of basin. In the case of groundwater, neighboring pumpers are likely to be impacted by an interbasin transfer.

origin (an in-kind payment) to compensate for the value lost in the exporting basin. This is a Class C Compensation example.

- Water diversions in the State of New York, a riparian doctrine state, requires compensation to nonriparians who have made use of the river, as well as to business and property owners whose values are diminished simply by the fact that the use of the river is affected. This may be a Class B Compensation example.
- A case where potential impacts on property values was to be compensated involves a low-level radioactive waste disposal facility in the State of Illinois. The State developed a mechanism to guarantee property values of private land owners. Adjacent property owners were guaranteed that upon sale of their property the state would either purchase the property at market prices presumed to prevail without the site influence, or make up the difference between the sales price and the expected market price without the site. This is a Class B Compensation example.
- On the same issue (low-level waste disposal) the State of Texas provided compensation in the form of payments to local governments to pay for public services and equipment for the community that would be host to the State disposal facility. This is a Class C Compensation example.

Alternative Revenue and Compensation Mechanisms

Direct and Indirect Payments

Third parties are of two classes. The first class is the set of parties who can identify direct impacts due to the water transfer. This group will be able to identify property value or income declines directly related to the water transfer. The second class is a diverse set of parties who are impacted indirectly but who can not establish a direct link to the transferred water. Different statutory powers and legal capacities are required to be able to pay third-party impacts for the two groups.

- As a general matter direct payments to impacted parties are difficult to arrange in Texas because of constitutional prohibitions. Article 3, section 51 and article 16, section 6 of the Texas Constitution prohibit Texas governments from making direct grants on behalf of individuals, paid solely out of state funds, unless such payment serves a proper public purpose.
- This prohibition may require that any third-party direct payment related to interbasin transfer needs to be authorized by a new statute defining interbasin transfer as a public purpose. Without such statutory definition, it will not be possible to make direct payments to individuals for income or property value impacts, regardless of how clearly impacted they are. It may be, however, that existing sections of the Water Code can be interpreted as a statement of public purpose for compensation for interbasin transfers.
- The only options for payment for third-party impacts in the absence of statutory provision of a public purpose definition is to allow funds to flow to entities with economic development or employment training program responsibilities who would be able to provide

very general economic benefits to the basin of origin. Such benefits would generally be of the form of information and advice for new or expanded business ventures, loans, loan guarantees and grants coupled with public sector projects, and perhaps employment training.

- Legislation clearly establishing interbasin transfer as a public purpose will allow direct payments, as well as more generalized public sector projects to be implemented as payment for third-party impacts to the parties who can identify direct impacts due to the water transfer. It may be that SB 1 can be so interpreted thus avoiding the need for statutory changes.
- The most likely parties of such impacts are farmers and "backward" and "forward" linked businesses[7] in agricultural areas, and (in surface water cases) property owners of certain lakeside properties.[8] The agribusiness and lakeside property owners can not be compensated very well by the provision of public sector projects and services.
- If direct payments, subsidies or cost sharing payments can not be made, the options for matching payments with impacts are very limited. The entire compensation program will necessarily be made up of public projects and/or services. Such payments could fund 1) information services about recreation and business opportunities, 2) cost-sharing for public water and waste water facilities, 3) cost sharing for water conservation programs, 4) cost-sharing for improving parks and recreation facilities, 5) cost sharing for improving waste disposal facilities to maintain or improve groundwater and surface water quality and 6) provision of public services less directly tied to water and waste water such as police and fire protection equipment and public school facilities.
- The provision of such public service facilities and services can be more or less matched with impacts by geographical location within the basin. The weakness of this approach is that the distribution of payments among impacted parties can not be matched well with many of the most pronounced impacts.

Revenue Sources

Third-party payments will have to be funded by a tax or fee placed on water transferred interbasin. The other unlikely alternative is direct state appropriations from the state general revenue fund.[9]

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[7] Economic transactions among industry types may be thought of as a chain of transactions from one industry to another until a basic product becomes a final product for consumers. Such chains of exchanges are referred to as either selling "forward" to industries which buy the products as input to their own production process (forward linkages), or buying "backward" from industries that sell their products as inputs to the current industry's production process (backward linkages).

[8] It is clear that agriculture will be generally the most impacted party since this industry is by and large the "marginal valued" user of water for irrigation, and will in the final analysis be the source of water transferred to other basins.

[9] Since there are more than 80 existing interbasin transfers in Texas, it is likely that these would need to be exempt from any new tax. Exemption seems appropriate since it is unlikely that these transfers have significant third party impacts and therefore, would not have to pay any taxes even if included under a new law.

- A tax or transfer fee could be imposed by either an appropriate unit of regional government or by the state of Texas. Legislation and perhaps changes to the state constitution would be needed to authorize such a tax or fee.[10]
- The size of the tax or fee could be more easily tailored to match the third-party impacts if set by a regional government. Since the size of third-party impacts will vary considerably among river basins, a state-wide fee will not allow costs to be imposed on the right users.
- If the state of Texas imposes a tax the laws will most likely require a uniform tax to be applied state-wide, meaning that the importing basin in a particular region would not necessarily face the full third-party costs imposed by this particular transfer.

Existing Institutions for Implementing Third-party and Net Regional Income Shares Payments

There are several existing institutions that could perform all or parts of the tasks of identifying and certifying impacted third parties and administering appropriate distribution of payments. There is, of course, the option to resolve third-party issues by special legislation for each transfer. This is often the means of resolving major conflicts. Hopefully, legislative guidelines and statutory authority can be developed to make the resolution of such matters more routine, thus encouraging needed interbasin transfers.

- The TNRCC has already developed rules that accommodate consideration of third-party impacts in § 288.7.[11] If Class A alternatives are developed, these rules would need modification to allow inclusion of net regional income sharing. The entity charged with the responsibility for carrying out a program of third-party payments and net regional income sharing would need to become a party to the TNRCC proceedings to approve a Certificate of Appropriation or Amendment for interbasin transfer. Many interbasin transfers are exempt from the requirements of SB 1, however, so that the practice of making third-party payments needs to apply to all interbasin transfers.
- There are several existing institutions and programs that could be useful in implementing a third-party compensation and net regional income gain sharing program.
- The Water Bank operated by the Texas Water Development Board (TWDB) could serve as a repository of state purchased water rights to be resold to water deficit areas after adding the costs of third-party impacts and a share of net regional income gains in the form of a fee. Or, more likely the Water Bank could serve as a mechanism to help bring buyers and sellers together by adding the capability for assessing and making third-party impact payments and net regional income gain shares.
- Payments from a state program run by the Board could include direct payments, property value guarantees, government service and facility cost sharing and contracts for local governments to operate economic development and employment training programs. The

[10] An important issue is whether a tax or a fee is better suited to the problem. This topic is discussed in the body of the report.
[11] Rules to implement Senate Bill 1 (1997), TNRCC, Chapters 288, 293, 294, 295 and 296.

Board could, more easily than most, operate a consistent set of state-wide programs, designate geographical areas of the exporting basin for specific public sector projects, etc.

- The Texas systems of river basin authorities are the other major entities able to implement much of Class A, Class B or Class C compensation programs. All of the river authorities would be able to do Class C programs because they have statutory authority to issue bonds and carry out water related functions and projects. These river authorities with electric sales would be able to compensate through economic development programs. All of the authorities would need authorization to impose fees to fund the programs though they would probably be able to receive funds from a fee or tax imposed by another state government entity.

- Existing economic development and employment training agencies would be the most likely entities to operate economic development and job training programs of grants, loans and conservation programs that will likely make up a major share (at least under a Class A type compensation program) of compensation payments. Some river authorities have active economic development programs under a recent Texas statute allowing river authorities that sell electric power to operate such programs.[12] Municipalities and city and investor-owned utilities also operate economic development programs that could be used (via contract) to implement the economic development part of the compensation program. Regional job training committees have recently been formed to plan and develop job training programs.

- One option for implementing direct payments to farmers and related agribusiness may be a cooperative agreement with the Texas Department of Agriculture to carry out a program of direct payments to farmers since they already have systems established to deliver various programs to farmers and agribusiness. Another option would be to do the same through cooperative agreements with Federal agricultural agencies that already make direct payments to farmers.

- There is no current program to make payments to property owners for the devaluation of property values.[13] If such payments are authorized for lake side property owners, a special program and related contingency fund would have to be designed. One possibility is to amend the property tax code to allow tax exemptions for qualifying devalued property, thus providing an equivalent income value without making direct payments. Such a mechanism might also be used, as an alternative to direct income payments, to compensate agricultural land owners who suffer farm value decreases due to loss of irrigation water. The loss to the taxing jurisdiction would be off set by public sector projects that reduce the future need for local taxes.

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[12] Art. 717p authorizes river basins that engage in the distribution and sale of electric energy to the public and that generates at least an annual average of 55 million kilowatt hours of electric energy to engage in an economic development program. This provision would have to be changed to make this option available to all river basins in the State.

[13] If a transfer of firm water out of basin increases the variability of the lake levels due to the loss of return flows, relative to that which would occur from a firm sale in the basin of origin, then lakeside property may be impacted.

Alternative Mechanisms

Given the revenue alternatives and existing institutional arrangements by which compensation payments can be made there are several alternative mechanisms and responsible agency alternatives for achieving the desired ends. Statutory and/or regulatory changes will be needed in varying degrees, depending on which agency does the function and which compensation approaches are authorized.

A number of mechanisms are available and institutions already exist for carrying out third-party compensation programs, but authority does not exit for imposing a fee or tax to fund such payments. (Such authority does exist for ground-water districts, however). The current authority to pay for any number of water development and conservation projects currently resides with river authorities and with the Texas Water Development Board and could be marshaled to accomplish a form of compensation. Some river authorities have the authority to operate economic development programs that could be the mechanism for delivering economic development opportunities through grants, loans and the like to compensate for general economic development opportunities lost due to the transfer of water out of basin. Employment training programs are also means of providing general economic growth opportunities for lost opportunity due to water transfers out of basin. The same kind of authority to operate economic development programs now peculiar to the river basins with electric sales would need to be extended to other river basins.

The kinds of payment that can be made under existing authority, however, are limited to water related activities that may not allow matching of benefits through compensation with income foregone at all. New and different legislative authority will be needed to compensate businesses and individuals for clearly identifiable negative impacts of lost water due to transfer. Since the assessment of the income foregone associated with a given transfer is a highly uncertain matter, one option for arriving at a reasonable number is to assign the responsibility of estimating such values to a responsible agent, such as the Texas Water Development Board, then set up a negotiating procedure to arrive at a reasonable number agreeable to the parties. Upon agreement, the negotiated compensation would be approved by the TNRCC in the hearing for approving the transfer. The table below summarizes the current authority, needed new authority for new approaches involved in Class A and B mechanisms, and a summary of the obvious institutional organizations to carry out the various options.

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Table 7. Alternative Mechanisms for Payment of Third Party Impacts

	Mechanism	Direct or Indirect	Income Equivalent	Class A	Class B	Class C
1	Direct income payments (farmers and agribusinesses)	Direct	Yes	X	X	
2	Property value guarantees	Direct	Yes	X	X	
3	Subsidies of water bills	Direct	No			X
4	Cost sharing or payment for water substitutes or capital equipment	Direct	No			X
5	Payment for water conservation devices / programs	Indirect	No			X
6	Fish & wildlife replacement	Direct	Yes	X	X	X
7	Intergovernment transfer for tax revenue losses	Direct	Yes	X	X	
8	Community economic development program	Indirect	Yes	X		
9	Employment training programs	Indirect	Yes	X		
10	Technology development	Indirect	Yes	X	X	X

Alernative Responsible Agency and Needed Legislative Authority

		Function/Legislation Needed		Administer Compensation Payments		
	Alternative Responsible Agency	Assess Fee (Taxing Authority)	Evaluate and Negotiate Compensation	Class A	Class B	Class C
1	TWDB as Broker via Water Bank (TWDB)	TWDB(EL)	TWDB(AA)	TWDB(EL)	TWDB(EL)	TWDB(AA)
2	TWDB as Broker/Trader via Water Bank (TWDB)	TWDB(EL)	TWDB(AA)	TWDB(EL)	TWDB(EL)	TWDB(AA)
3	River Authorities as Broker (RA)					
	a. all functions	RA(EL)	RA	RA(EL)	RA(EL)	RA
	b. split functions	TWDB(EL)	TWDB(AA)	RA(EL)	RA(EL)	RA
4	Regional Water Planning Groups (RWPG)					
	a. all functions	RWPG(EL)	RWPG(EL/AA)	RWPG(EL/AA)	RWPG(EL/AA)	RWPG(EL/AA)
	b. split functions	TWDB(EL)	TWDB(AA)	RWPG(EL/AA)	RWPG(EL/AA)	RWPG(EL/AA)
5	New Agency (NA)	NA(EL)	NA(EL/AA)	NA(EL/AA)	NA(EL/AA)	NA(EL/AA)

Notes: EL=Enabling Legislation needed; AA= Appropriation Authority needed

The options and existing or new authority to carry out the various compensation methods are briefly described here.

I. Expand the Role of the Texas Water Bank to Broker Interbasin Transfers

Some of the statutory authority already exists under Senate Bill 1030 and Senate Bill 1 to carry out this alternative. There may be a need to pass legislation to make it clear that compensation (defined as either Class A, B or C) for interbasin transfers is a public purpose and that the imposition of a fee for such purpose is appropriate. Otherwise, the authority to impose a compensation fee for the purposes defined would need statutory authority. TNRCC rules for approving an interbasin transfer already exists and allows an unspecified compensation payment to be part of the hearing for the approval of a permit to appropriate or change an existing water right. Statutory authority would be needed for making direct payments to businesses and individuals under Class A and Class B compensation, but only appropriation authority under Class C compensation.

II. Expand the role of the Texas Water Bank to Include the Ability to Use Bond Money to Buy and Sell Water and Water Rights

The Class A, B and C compensation methods would be the same as in I. Statutory authority to implement this alternative is the same as alternative I, except authority would be needed to use bond money to purchase water or water rights for resale. The funding and bond authority requirements could be very large.

III. Expand the Role of River Basin Authorities

Statutory authority will be needed to allow river authorities to (1) impose the compensation fee, (2) expand the number of river authorities who are able to operate economic development programs and (3) allow direct payments to business and individuals under Class A and Class B Compensation. Existing authority is adequate to carry out enhanced water related functions, funded by the compensation fee under Class C Compensation, except for the use of a utility bill credit mechanism for payments. A statutory declaration of compensation for interbasin transfer to be a public purpose, and the ability to impose the fee would be needed to exercise this mechanism. Further, a statute would be needed authorizing the imposition of the fee and proclaiming compensation (defined as either Class, B or C) for interbasin transfers to be a public purpose and that the imposition of a fee for such purpose is appropriate.

IV. Expand the Role of the Regional Water Planning Groups (RWPG) to Carry Out a Compensation Program

Statutory authority, modifying the provisions of SB 1 to expand the role of the regional planning groups would be needed. Although these organizations do not currently have the capacity to complete such functions, they are currently forming political struc-

tures to represent planning region interests. These groups would, of course, have to develop organizational and staff functions appropriate to the tasks. The statutory changes would need to clearly identify compensation (defined as Class A, B or C) for interbasin transfer as a public purpose, and authorize the RWPGs to have the power to impose a compensation fee. Further, in order to be able to carry out Class A and B compensation programs, statutory authority would be needed for making direct payments to businesses and individuals.

V. Create a New Entity to Carry Out a Compensation Program

All of the statutory powers of taxation and ability to make payments to impacted parties, assess the size and incidence of impacts, negotiate payments and to carry out general programs of economic development contained in IV above would be needed to allow a new entity to implement a compensation program. One advantage of such an approach would be to reduce the level of internal conflicts of interest inherent in the existing institutions. A disadvantage of creating a new entity would be the further splintering of water groups and lack of institutional knowledge.

Three Prospective Texas Examples

Three examples of interbasin transfers of various sizes are reviewed here to provide an idea of how the compensation mechanisms identified would work out in particular cases. The examples use reasonable "ball park" estimates of the value of water in different uses and related incomes generated by such uses, as well as available alternatives to the transfer in order to determine the expected net income effect on the two regions involved in the transfer. Any negative impacts on regions that compete with the receiving basin for economic output are ignored. The value of water estimates used in this study mean the income value of water, not the price of water one might expect to observe in today's market.

The income value of a commodity or resource that is traded in the market place is the standard way of measuring the appropriate economic value of such if one is concerned with answering the question of how much of a monetary payment needs to be made to someone to make him as well off as he would otherwise be without (a portion of) the commodity or resource in question. If the resource in question is not traded in the market place, the measure of its economic value that is equivalent to the income measure mentioned above is a "willingness to pay" value. The economic value of water in various "uses" means not only the values associated with, for example, the irrigation of crops, but also the aesthetic and recreation values of water. Such "non-market" values are revealed in the economic behavior of consumers.

Even though the idea throughout this study is to find a monetary payment that would leave people no worse off than they would be with the water in question, we do not claim that these income values necessarily incorporate all of the value of water. Clearly, some values of water are beyond that which could ever be compensated for with mone-

tary payments. (See Chapter VI for a more detailed discussion of the measurement of the income value of water)

Example 1: East Texas to Houston

Description. The Houston area municipalities will join in a cooperative agreement to develop or enhance an integrated system of pipelines, canals and reservoirs to supplement the area municipal water supplies rising periodically to 600,000 acre-feet per year of Sabine River Basin water in the year 2050. The City of Houston will purchase the water out of surplus surface water in the Sabine to be diverted out of Toledo Bend Reservoir and delivered to key points in the San Jacinto and Brazos River Basins, mainly into Lake Conroe, Lake Houston, Somerville Lake and Allens Creek at a price of $16.25 per acre-foot.[14] The certificate will designate M&I use.

Impacted third parties in the Sabine are of two classes; fish and wildlife and related recreation and the overall economy because of the loss of the long term option to develop the surplus water.

Class A Compensation

Approximate Size of the Impacts. Various annual impacts in the Sabine River Basin and in the Houston area are expected to occur as a result of a major interbasin transfer of Sabine River water to Houston area municipalities. Houston area municipalities, under the Class A Compensation, would pay an annualized amount to support third-party payments to the Sabine River Basin for replacing valuable resources and regional income lost, plus 50% of the annual net regional income gain for the aggregate of the two regions.

- Estimated annual losses in the Sabine range from $5.8 million per year in 2010 to $17.5 million in 2050. Positive annual income impacts in the Houston area range from $46.7 million in 2010 to $140.0 million in 2050. Transportation costs range from $24.9 million in 2010 to $46.4 million in 2050.
- The project as structured would result in a net present value (NPV) of future net benefits to each region of $467.8 million, and average third-party payments (including income sharing) by Houston of $34.7 million per year or $713.0 million in net present value.
- Houston could afford to make an up-front payment to the Sabine folks of $713.0 million, invest $364.2 million in transport facilities and still gain an average annual net income flow of $23.0 million with a net present value of $467.8 million.

[14] The Sabine River Authority owns the water rights to approximately 750,000 acre-feet per year of Toledo Bend Reservoir water. Approximately 250,000 acre-feet remains unappropriated. For purposes of this example it is assumed that the 600,000 acre-feet are purchased from SRA under a raw water, 50 year contract, guaranteed renewable into perpetuity at a price justified by SRA cost of service (approximately $0.05 per 1,000 gallons, or $16.25 per acre-foot).

- A transfer fee of $87 per acre-foot would be required to pay for third-party impacts and revenue sharing; 67% of the payment would be for income sharing and 33% for third-party impacts.

Class B and C Compensation

Example 1: Approximate size of the Impacts. The third-party impacts, excluding a 50% share of net regional income gains, are much smaller than in the case of Class A Compensation.

- The third-party impacts, without net income sharing, would require Houston to make average annual payments of $29 per acre-foot to the Sabine region, or an average annual payment of $11.7 million.
- The net present value of future net benefits to the Houston area, after paying $16.25 per acre-foot for the water, and $29 per acre-foot for third-party impacts, would amount to $935.6 million, or an average of $46 million per year.
- Class B and C Compensation would require average annual third-party impact payments of $29 per acre-foot compared to $87 per acre-foot under Class A Compensation. The NPV of net income gains to the Houston area are $935.6 million under Class B and C Compensation and $467.8 million under Class A Compensation.

Example 2: LCRA to San Antonio.

Description. The City of San Antonio will purchase firm, raw water under contract with LCRA and divert up to 100,000 acre-feet per year from Lake Travis. Pipelines will be constructed to transport the water to Canyon Reservoir for storage and withdrawal as needed under an agreement with the Canyon Reservoir operator, to move the water through Canyon Lake and inject it into San Antonio's water system at key entry points near San Antonio thus directly backing out groundwater withdrawal from the Edwards. It is estimated that San Antonio will pay $105 per acre-foot for the water (based on LCRA's cost of service).

The third-party impacts of the transfer will include income and property value loses for lake side property owners on Lake Travis, recreational opportunities principally on Lake Travis, fish and wildlife in areas downstream from Lake Austin, and potential municipal and industrial use in the Lower Colorado. Such impacts will occur because of increased variation in lake levels associated with reduced downstreamflows because of the loss of return flows, when compared to the alternative of developing the water for municipal and industrial (M&I) use in the Lower Colorado basin. The probability of future M&I use in the basin is assumed to be 20% in year 2010, 50% in 2030 and 100% in 2050.

Class A Compensation

Approximate Size of the Impacts. The results of this example show that the net regional income gain is negative in all years. While the positive income impacts to San Antonio exceed the negative income impacts in the Lower Colorado, transportation costs make the project unfeasible. The project as structured would result in a NPV of future net regional income for the two regions of -$135.6 million.

- One component of third-party impacts is lake side property value losses on Lake Travis, valued at $531 thousand in 2010 and $2.1 million in 2050.
- The results show that the net regional income will be negative in all years, and therefore the project should not be built. The average annual net income for the two regions is estimated to be a negative $7.1 million with a net present value of a negative $135.6 million.
- The project is not feasible primarily because of prospective, comparable valued development of the water for similar purposes in the Lower Colorado basin in the future, plus transportation costs and impacts on lake side property values. The analysis assumes that up to 100,000 acre-feet of water is available from irrigators in the San Antonio region at $100 per acre-foot in the alternative.

Class B and C Compensation: The third-party impacts, excluding a 50% share of net regional income, imply that if the project was completed, San Antonio would pay $105 per acre-foot for the water, average transportation costs of $96 per acre-foot and an average $89 per acre-foot in third-party impacts, or $290 per acre-foot. The marginal value of water purchased from agriculture in the San Antonio area (irrigation use from the Edwards aquifer) is considerable lower cost, assumed here to be available for $100 per acre-foot (a net, direct income value of $50 per acre-foot to the irrigator).

Example 3: Lower Colorado to Corpus Christi.

Description. The transfer of 35,000 acre-feet of raw water from the Colorado River to the City of Corpus Christi will come from a purchase of interruptible irrigation district water in the Lower Colorado.[15] The point of diversion would occur at the facilities currently used in the City's agreement with Garwood Irrigation Company and may amount to a maximum diversion of 35,000 acre-feet per year to be transported through the Lake Texana-to-Corpus pipeline.

The primary impacted parties are those individuals and businesses forward and backward linked to the agricultural sector. The irrigation users will be paid for their in-

[15] LCRA currently sells non-firm contract water to rice farmers in the coastal plain for a price of $4.50 per acre-foot. The conservative estimate here is that farmers would be willing to resale 35,000 acre-feet of non-firm water at $36 per acre-foot, a price that would recover the income they expect to derive from the irrigation of rice. It is not known whether the actual LCRA contracts allow resale, but such a capability is assumed for purposes of this example.

terruptible water supplies, the value of which is assumed to be equal to the water income value to the irrigation farmers. Those not paid in the primary transaction are the third-party interests that have to be compensated.

Class A Compensation

Approximate Size of the Impacts. The results of this example show that the project is feasible under the methods and procedures proposed here, resulting in net income benefits to both regions. The annual 35,000 acre-feet will make the existing pipeline operate at capacity thus making it efficient and helping make the project feasible. The transfer will pay positive dividends to both regions. The net present value of future net benefits to each region is $17.1 million or an annual average of $785 thousand.

- Corpus Christi will pay an estimated $36 per acre-foot for the water transferred. Including the transportation cost, third-party impact costs and $36 per acre-foot for the water, the total cost of water in Lake Corpus Christi is estimated to be $189 per acre-foot or $0.58 per thousand gallons.
- The results show that the net regional income will be positive throughout the period at transfer rates of at least 15,000 acre-feet per year.
- The average annual payment by Corpus Christi to the residents of the Lower Colorado basin is $2.5 million which has a net present value of $56.8 million.
- Corpus Christi could afford to make an up-front payment to the Lower Colorado folks of $56.8 million, invest $40.5 million in transport facilities and still gain an average annual net income flow of $785,398 or a net present value of $17.1 million.
- An average transfer fee of $85 per acre-foot would be required to pay for third-party impacts and revenue sharing; 31% of the payment would be for income sharing and 69% for third-party impacts.

Class B and C Compensation: The third-party impacts, excluding a 50% share of net regional income gains, are smaller than in the case of Class A Compensation.

- The third-party impacts, without net income sharing, would require Corpus to make average annual payments of $58 per acre-foot to the Lower Colorado basin, or an average annual payment of $1.8 million.
- The net present value of future net benefits to the Lower Colorado area, after paying $36 per acre-foot for the water, and $58 per acre-foot for third-party impacts would amount to $34.3 million, or an average of $1.6 million per year.
- Class B and C Compensation would require average annual third-party impact payments of $58 per acre-foot compared to $85 per acre-foot under Class A Compensation. The NPV of net income gains to the Corpus Christi area are $34.3 million under Class B and C Compensation and $17.1 million under Class A Compensation.

Impediments to Various Mechanisms

The primary impeding factor to implementing a compensation mechanism is gaining political acceptance for changing the historical notion of preference for water availability in the basin of origin to that of a guarantee that water will not be committed to out-of-basin use without full compensation. Protection of the area or basin of origin would be provided through off-setting values or compensation.

One difficulty of implementing a compensation program is getting agreement among the interested parties on the size of the compensation payment. There are widely varying beliefs concerning the regional income that can be generated by having water supplies available. The proposed approach in this report is to assign a responsible entity the task of estimating the income contribution of the water to be transferred in the two basins, and to negotiate the associated value among the parties. Having reached an agreement, the compensation plan would be included in the applicant's application for a change of the water right permit at the TNRCC.

The primary impeding factors under current law are the limitations of governments on direct payments to individual private parties, and possible restrictions on the current ability to impose taxes or fees to fund such payments, at least in a way that guarantees economic efficiency and equity. There are a number of alternative means of avoiding the constitutional problems that are possible, building off of the fairly recent changes in the constitution and through correctly designed legislation regarding the operation of economic development and energy conservation programs.

The most troublesome part of the third-party compensation problem is that of direct payments to property owners for decreased property values due to the transfer. The three examples illustrate the potential importance of this problem.

Direct income payments, or payments to defer costs, will likely be equally troublesome. Although direct payments to private parties are commonplace in Federal programs they are not in the states except in the welfare programs area where state money matches Federal money. These programs operate off of statutory authority to allow the state to receive the Federal money under matching rules, and depend on specific recipient qualifications. The welfare and health care type programs are based on "means tested" populations, meaning groups must be certified based on their means in order to qualify for payments.

Direct payments to individuals for reducing the future need for electric capacity additions have been justified by a statute declaring the program to be a public purpose. The key is to provide statutory authority which will satisfy four criteria:

1) is accomplishment of a public purpose the predominant purpose of the transaction
2) is there assurance that a public purpose will be accomplished

3) is there sufficient protection of the handling of the public money
4) is there "consideration" passing to the political subdivision.

Finally, if regional entities such as the river basin authorities are to implement such a compensation program, they will need authority to impose a compensation fee and to operate an economic development program and be able to distribute funds to utilities to provide credits to individual utility bills.

Resource Economics, Inc.
Austin, Texas
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I. INTRODUCTION

The water supplies in Texas are not well distributed according to population centers and related industrial activity. The location of supplies is primarily an accident of nature while there are many factors that govern the location of economic centers of commerce and related population, only one of which is the availability of good quality affordable supplies of water. Population and economic activity--industrial and commercial enterprises--will not necessarily move to where the water is located. Residential and commercial users will pay more for water and or conservation measures if necessary to remain in the centers of commerce.

The water law in Texas and the other Western states is currently designed to protect the regions of plentiful water supplies from unreasonable transfer of surface water supplies out of the basin of their natural origin. Texas also has laws allowing protection of groundwater supplies from transport out-of-district. While there were many good reasons for such laws and rules in the past, there are currently compelling reasons for changing the rules to allow out of basin transfer to occur more freely in order to serve the interests of all Texans. Fortunately, the rules can be changed to allow transfer to occur more freely while still protecting the interests of the basin of origin. In fact, the interests of the basin of origin can be fully respected and also provide the prospect of increasing the income benefits to the basin by adopting favorable rules of compensation.

This study defines the principal of compensation and identifies alternatives for setting up the taxation of transfers and means of paying benefits to the key parties directly impacted by transfers and for the administration of economic development and other general initiatives that share the economic gains from the transfer with the exporting basin.

Interbasin transfer is not as rare under current conditions as many people believe. There currently are more than 80 interbasin transfers in Texas. Further, the idea of third-party payments (of sorts) is not new regarding these transfers. There have been a number of informal arrangements made that amount to in-kind payments by the importer of out-of-basin water designed to benefit the exporting basin residents by maintaining agricultural water supplies and constructing impoundments to provide water supplies to the basin of origin. Perhaps there are other types of informal payments that we are not aware of because such agreements are not required to be reported in the TNRCC hearing process.

While it will be possible to reach agreement on future transfer by way of such informal arrangements, there are potentially better ways of compensating the basins of origin through formalized arrangements and rules. This report examines the alternatives for third-party compensation mechanisms that should result in more needed interbasin transfers and more efficient use of the state's water resources.

The report reviews the current legal and regulatory framework within which transfers must currently occur, summarizes examples of third-party compensation in Texas and other western states, constructs a rationale for transfer, lays out major factors to be considered in designing compensation rules, identifies current and possible new institutions for completing payments and setting fees to provide revenues and provide three example cases to show how the mechanisms could work.

II. Review of the Current Legal/Regulatory System Regarding Interbasin Transfer

Current statutes, regulatory rules and court decisions significantly influence the number and magnitude of interbasin transfers. They have not prevented interbasin transfers, however, as there are currently more than 80 such transfers in Texas (see list in Appendix E).[1] The prevailing law guiding interbasin transfers is the Texas Supreme Court ruling in 1966 in City of San Antonio v. Texas Water Commission which held that the Texas law prohibits interbasin transfers if the transfer would "prejudice any person or property" within the basin of origin; prejudice is to be determined by weighing the detriments to the basin of origin against the benefits of the diversion. Senate Bill 1 contains a "junior" water rights provision that makes the right to transfer water junior in priority to water rights granted before the time of the application for transfer.

An interbasin transfer of surface water requires a modification of the holder's permit issued by the TNRCC to specify any change from a current permit. Unappropriated surface water (not much of which currently exists without impoundment) could be transferred but would require an original permit of appropriation from the TNRCC, specifying the purpose or intended use of the water, the source, the diversion and impoundment points and the quantity to be diverted per unit of time. If the transfer is from groundwater sources, there is no regulation unless the source is from within one of many groundwater districts in the state. In this case the groundwater district may limit, but not prevent, a transport out of district. In any case, some districts may impose a transport fee in addition to withdrawal fees or taxes on withdrawal.

The price of the sale of water rights out of basin needs to be at a "fair market value" as defined by Sec. 11.0275 of Chapter 11 of the Texas Water Code. However, the TNRCC does not have original jurisdiction over such sales prices but may apply a test of reasonableness if there is a complaint by an interested party. A supply contract price from stored or conserved water shall be "just and reasonable and without discrimination" (Sec. 11.036) and if any person uses the stored or conserved water without contract the "user shall pay for the use at a rate determined to be just and reasonable" (Sec. 11.036). TNRCC may apply a test of whether the public interest is served by a transfer at a price for the sale of a water right.

Original jurisdiction over retail rates for treated water resides with the TNRCC unless the matter is within the jurisdiction of a municipality, river basin or groundwater district. TNRCC has appellate jurisdiction over retail rates, to which they will apply cost of service methodologies to determine reasonableness, as specified in Chapter 290 of the TNRCC regulatory rules.

[1] Draft list provided by Mr. Terry Slade, TNRCC, February, 1999.

TNRCC does not have original jurisdiction over prices changed for wholesale sales of water, but may take up a case under appellate jurisdiction in response to a complaint by an interested party.

Changes to TNRCC rules to implement SB 1 from the 75th Legislature have been adopted and contain specific provisions for interbasin transfers. Under the new rules an applicant seeking to obtain a new or amended water right necessary for an interbasin transfer will have to submit certain information, and a hearing will be required. Information required to be submitted includes:

(1) the contract price of the water to be transferred;
(2) a statement of each general category of proposed use of the water to be transferred and a detailed description of the proposed uses and users under each category;
(3) the cost of diverting, conveying, distributing, and supplying the water to, and treating the water for, the proposed users;
(4) the projected effect on user rates and fees for each class of ratepayers;
(5) an analysis of whether and to what extent there is the need for the water in the basin of origin and in the proposed receiving basin based upon the period for which the transfer is requested, but not to exceed fifty (50) years;
(6) factors identified in the applicable approved regional water plans which address the following:

    (A) an analysis of the availability of feasible and practicable alternative supplies in the receiving basin for which the water is needed;
    (B) the amount and purposes of use in the receiving basin for which the water is needed;
    (C) the proposed methods and efforts by the receiving basin to avoid waste and implement water conservation and drought contingency measures;
    (D) the proposed methods and efforts by the receiving basin to put the water proposed for transfer to beneficial use;
    (E) the projected economic impact that is reasonably expected to occur in each basin as a result of the transfer;
    (F) the projected impacts of the proposed transfer that are reasonably expected to occur on existing water rights, instream uses, water quality, aquatic and riparian habitat, and bays and estuaries that must be assessed under Texas Water Code §11.147, 11.150, and 11.152 and related commission rules contained in §297.49 - 297.52 of this title in each basin. If the water sought to be transferred is currently authorized to be used under an existing water right, such impacts shall only be considered in relation to that portion of the water right proposed for transfer and shall be based on historical uses of the water right for which amendment is

sought;

(7) proposed mitigation or compensation, if any, to the basin or origin by the applicant;
(8) the continued need to use the water for the purposes authorized under the existing water right if an amendment to an existing water right is being sought; and
(9) any other related information the executive director or commission may require to review the application to make recommendation or determine, as applicable, whether it meets all applicable requirements of the Texas Water Code or other applicable law.

(C) Subsection (b) of this section shall not apply to:

(1) a proposed transfer which in combination with any existing transfers totals less than 3,000 acre-feet of water per annum from the same water right;
(2) a request for an emergency transfer of water under §297.17 of this title (relating to Emergency Authorizations);
(3) a proposed transfer from a basin to its adjoining coastal basin; or
(4) a proposed transfer from a basin to a county or municipality or the municipality's retail service area that is partially within the basin for use in that part of the county or municipality and the municipality's retail service area not within the basin.

III. THE RATIONALE FOR COMPENSATION

Historically the water laws in the Western U.S. have protected the basin or area of origin from unreasonable transfers of its surface water supplies out of basin by reserving **water** for the area's ultimate requirements or providing for recapture in the event of future need. Texas has a system of basin of origin protections, although it has never "reserved" water for use in the basin of origin. Texas Supreme Court ruling in 1966 in City of San Antonio v. Texas Water Commission held that the Texas law prohibits interbasin transfers if the transfer would "prejudice any person or property" within the basin of origin; prejudice is to be determined by weighing the detriments to the basin of origin against the benefits of the diversion. Senate Bill 1 contains a "junior" water rights provision that makes the right to transfer water junior in priority to water rights granted before the time of the application for transfer.[2] While there is a well founded and long history of such practices throughout the Western states, the current conditions in Texas suggest that transfers be encouraged, rather than discouraged, through a program of compensation.

The need for policies that encourage interbasin transfers and transfers from low valued uses to higher valued uses is clear from events now occurring in Texas. One means of encouraging such exchanges is through solving one of the major problems with such exchanges, that of third party compensation. The current State Water Plan summarizes the current conditions:

> "Today, increasing relative scarcity and competition for available water, the high cost of new water supply development, and heightened environmental concerns make it difficult to marshal the public support needed to bring major new water development projects to fruition. Against this backdrop, Texas' population is projected to double over the next 50 years, and the water needs of its cities and industries are expected to correspondingly increase. Water is becoming evermore costly for Texans, and the lack of locally-available water supplies has prompted major urban areas to look to other regions in their search for water. At the same time, adequately providing for water needs of the environment has come to be recognized as an essential element of sound water planning and management."[3]

Protection for the area or basin of origin will be preserved by requiring compensation to the basin of origin that is at least as valuable as the transferred water when third-party interests are included. Primary parties are compensated by the purchase price of the water (if any), assuming the water is sold in a fair trade. Note: the purchase price will be zero in the case of unappropriated water. The third parties to be

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[2] Section 11.085, Texas Water Code, Section (s). Note: prior to passage of SB 1059 in 1991, the TWDB was precluded from planning for interbasin transfers which contemplates or may result in the removal of surface water from river basin of origin if the water is foreseeably needed in that basin over the next 50 years.

[3] Water for Texas: A Consensus-Based Update to the State Water Plan: Vol. II, Technical Planning Appendix, Texas Water Development Board, August 1997, p. 1-1.

compensated are those who benefit from the water but do not have established rights to it. Protection through compensation described in this report will encourage transfers that will often result in net economic gains for both the exporting and importing basins, as well as the Texas economy at large. This study identifies alternative third-party compensation mechanisms and illustrates how they might be applied in three important Texas examples.

This study defines "mechanism" as the process, actions or steps that will achieve compensation of third parties for economic losses due to transfer of surface water from one basin to another. A third-party is any individual, business or government in the basin of origin or the receiving basin that is economically affected by the transfer, but is not one of the two direct parties to the transfer. A mechanism may be a set of rules adopted by an existing agency of a state or local government, or an institution set up by the State Legislature to carry out the functions of receipt of revenues and payment of compensation required as the result of approval of the transfer.[4]

Mechanisms can not be identified, however, and the size of payments can not be determined without some idea, some framework, for evaluating the interbasin transfer. The evaluation of the reasonableness of the terms of trade in an interbasin transfer, which needs to include third party effects, is part of an overall framework of evaluating public sector involvement in water resources allocation.

Water resources in Texas, and elsewhere in the U.S., are either traded in very "thin" markets or traded by administrative agencies of governments. Therefore, one can not easily examine a trade of water rights, or water under contract, to determine if the trade is a reasonable one--a trade that satisfies all who have a right to expect it to be reasonable. By contrast one does not have to worry about whether the exchange of $1.00 for a gallon of gasoline by a driver and a service station operator is a reasonable one because there are many buyers and sellers in the gasoline market. That is, the retail market for gasoline is a competitive one where prices are transparent and the commodity is a uniform one; one only has to compare prices at other locations to determine that the terms are reasonable. Water is somewhat unique for several reasons other than thin markets. One such reason is the fact that downstream users who do not have an established right to the water are nonetheless, impacted by a trade upstream that removes water from the stream. Such interdependencies do not exist in the gasoline market example, or for most commodities purchased in the U.S. Other means must be employed to evaluate water exchanges, including interbasin transfers and the associated payments to third parties.

The economics literature, government documents and Acts of the U.S. Congress related to the evaluation of public sector involvement, or intervention, in private sector markets that allocate water resources has defined a number of objectives of such intervention. Evaluation of government intervention, often amounting to the investment

[4] In the case where the primary transaction is strictly among private parties, the mechanism may be a set of regulatory rules for how the private entities must behave in order to maintain the right to transfer water.

of tax dollars, is then a process of evaluating the expected outcomes of a particular project or decision measured against these objectives. Public policy of the various states and of the federal government typically focus on (1) economic efficiency, (2) regional economic development and income redistribution and (3) protection of environmental quality.[5]

The objectives for evaluating federal involvement in water resources has developed over a period of sixty plus years. The U.S. Congress declared in 1936 that benefits must exceed costs, "to whomever they may accrue", which marked the beginning of the standardized use of benefit-cost analysis for evaluating federal involvement in water resources projects.

Official government documents and the writings of water resource experts since 1936 have continually supported the use of economic efficiency criteria for evaluating public sector investment in water resource projects. Other criteria have also been recognized, including regional economic development, income redistribution and environmental protection. The U.S. Bureau of the Budget's Circular A-47 in 1952 discusses economic efficiency and meeting regional needs.[6] The Federal Interagency Committee on Water Resources reaffirmed these two objectives in a 1958 report.[7]

The U.S. Water Resources Council further formalized the objectives of federal government involvement by setting out four "accounts" on which federal evaluations must be based. The accounts are (1) national economic development, (2) regional development, (3) environmental quality, and (4) social well-being.[8] More recent updates to this policy statement have retained these four accounts, although the economic efficiency objective (national economic development), while protecting the environment, has taken the stronger weight.

Texas law and procedures are not as precise on the matter of objectives of state involvement in water resources development as summarized above for the federal government. The same themes, however, seem to be inherent in Texas policy. Section 16.051 of the Texas Water Code directs that the "Executive Administrator shall prepare, develop, and formulate a comprehensive water plan.....The Executive Administrator shall direct his efforts toward the orderly development and management of water resources in order that sufficient water resources shall be available at a reasonable cost for economic development of the entire state....the Executive Administrator shall also give

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[5] R. A. Young and R. H. Haveman, Chapter II: "The Economics of Water Resources", in *Handbook of Natural Resource and Energy Economics: Vol. II*, Ed. Allen V. Kneese, Resources for the Future, North Holland, 1985, p. 475.

[6] U.S. Bureau of the Budget, "Reports and Budget Estimates Relating to Federal Programs and Projects for Conservation, Development and Use of Water and Related Land Resources", Circular A-47, Washington D.C., 1952.

[7] U.S. Interagency Committee on Water Resources, "Proposed Practices for Economic Analysis of River Basin Projects, Revised", U.S. Government Printing Office, Washington D.C., 1958.

[8] U.S. Water Resources Council, *Water Policies for the Future, Final Report*, U.S. Government Printing Office, Washington D.C., 1973.

consideration in the plan to the effect of upstream development on the bays, estuaries, and arms of the Gulf of Mexico."[9]

Acts of the Texas legislature and the state courts have established that the State of Texas owns the surface water in the state, held in trust for the citizens of Texas. Use of surface water requires a permit from the Texas Natural Resource Conservation Commission (TNRCC) which may be granted only if the water is to be put to "beneficial use", among other conditions, and that the surface water right is not detrimental to public welfare. Groundwater is owned by the private landowner, who may use all the water available for whatever purpose, under the legal doctrine of "right of capture", unless the land is within one of the state's ground-water districts. If the land is within a ground-water district, certain restrictions on the unrestrained exercise of the right of capture may be imposed.

Interbasin transfers of surface water within Texas require the approval of the Texas Natural Resource Conservation Commission unless they have been exempted from such approval by the legislature. TNRCC requires certain information be submitted with such an application, including (1) the contract price, (2) a statement of proposed use, (3) the cost of diverting, conveying, distributing, and supplying the water to, and treating the water for, the proposed users, (4) the projected effect on user rates and fees for each class of ratepayers, (5) an analysis of the need for the water in the basin of origin and in the proposed receiving basin for up to 50 years in the future, (6) factors which address (a) the availability of feasible and practicable alternative supplies in the receiving basin, (b) ...(d) the proposed methods and efforts by the receiving basin to put the water to beneficial use, (e) the expected economic impact that is expected to occur in each basin as a result of the transfer, (f) the projected impacts of the transfer on existing water rights, instream uses, water quality, etc., (g) proposed mitigation or compensation, if any, to the basin of origin by the applicant.....

One interpretation of the group of Texas water laws governing surface water allocation is that economic efficiency criteria for judging the reasonableness of planned development, conservation, and interbasin transfers are implied in order to provide water at reasonable costs to promote economic growth, subject to restrictions for protection of the environment. The TNRCC information requirements for applicants of an interbasin transfers not only require demonstration of beneficial use, but also require analyses of economic impacts in both basins, an analysis of available alternatives to the transfer within the receiving basin, and a plan for mitigation and third party compensation--all needed components of a thorough benefit-cost analysis. Specific methodologies, such the use of benefit-cost analysis, for making such judgments have not been adopted in Texas, however, as has been done at the national level.

The TNRCC is required to use a cost of service, rate of return on investment approach to judging the reasonableness of rates charged consumers by water utilities. The agency also uses this approach to test the reasonableness of the sales price in an

[9] Texas Water Code, Section 16.051.

interbasin transfer. While there are questions about the extent to which such regulatory approaches to pricing utility services produces a competitive market-like outcome, that certainly is the intent of the approach.

A summary of the conditions for economically efficient interbasin transfers that is largely consistent with the implied assessment made during the hearing process at the TNRCC has been laid out by Young and Haveman:

> a) The increments of net incomes in the importing region or regions must exceed the sum of (i) the loss of incomes in the exporting basin, (ii) net income losses in regions whose outputs are competitive with those in the importing region, and (iii) the costs of the physical conveyance systems.
> b) The cost of the physical transfer system must be less than the cost of the best alternative for supplying the same amount of water to the importing region. [10]

The following "guiding rule" adopted for this study follows the Young and Haveman criteria, but also requires payment to impacted third parties in the basin of origin, as well as, a sharing of regional net income gains. Such payments, while not required for economic efficiency, will provide a large measure of equity associated with the transfer, and in many cases, provide a net income flow to both regions to encourage economic development in both regions. Note that the TNRCC approach to the use of cost based rate of return regulation of exchange prices among the two primary parties to the transfer may impede interbasin transfers because such a price may be considerably below the going market price for water. The provision considered in this study to require sharing of net income gains will go a long way toward overcoming this disincentive.

The guiding rule for the approval of an interbasin transfer and the provision of third-party compensation considered in this study is as follows:

(1) the receiving basin, as a condition of the transfer, should replace the third-party income foregone[11] (including the equivalent value of lost fish and wildlife) in the basin of origin; analysis of the potential income losses in regions that produce economic outputs that are competitive with those of the importing basin should be provided; [12]

(2) the receiving basin should share the net regional income gain with the

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[10] R. A. Young and R. H. Haveman, Chapter II: The Economics of Water Resources in Handbook of Natural Resource and Energy Economics: Vol. II, Ed. Allen V. Kneese, Resources for the Future, North Holland, 1985, p. 506.

[11] Income foregone is used throughout this report because often the impacts on income from water transfers is the income given up by parties who, currently, or in the future are deprived of the use of water to produce income because it has been put to an alternative use. The alternative term, lost income implies that existing income is taken away, which may not be the case.

[12] This condition ignores payment of income impacts to regions whose economic production is competitive with that of the importing basin. Economic efficiency only requires that aggregate net benefits exceed aggregate costs, including the accounting for income losses to competing regions. Actual payment to third parties in the exporting basin is recommended here for equity purposes and to encourage transfers.

basin of origin[13]; and

(3) the transfer should only occur if the net regional income gain due to the transfer for the set of regions in the aggregate (including the equivalent value of fish and wildlife changes) is positive, given all feasible alternatives to the transfer. This implies that a transfer should occur only if the transferred water, including the costs of transportation and payment for third-party income losses, is the lowest cost water available to the importing basin.

The three-part rule is economically efficient because it encourages a scarce natural resource to be put to its highest valued use. The rule is equitable because the primary losers to a transfer are fully compensated, and receive a proportional share of any net gains of the transfer.[14]

The three-part guiding rule is consistent with the Texas Supreme Court ruling in 1966 in City of San Antonio v. Texas Water Commission. The court held that the Texas law prohibits interbasin transfers if the transfer would "prejudice any person or property" within the basin of origin; prejudice is to be determined by weighing the detriments to the basin of origin against the benefits of the diversion. The above three-part rule would, however, require repeal of the SB 1 provision that makes transferred water rights junior in priority to basin of origin rights in place at the time of the transfer, which does discourage beneficial transfers.

The equation set that describes the three part rule is as follows:

(a) The transfer should occur if the combined regional income change is positive

$$PV\Delta RNI = Q^*\{\Sigma(MV_{rb} - MC_{eb})^*IM_{rb} - \Sigma (MV_{eb} - MC_{eb})^*IM_{rb}\} - T > 0 \quad (1)$$

where

$PV\Delta$ RNI = present value of then change in combined regional income (including the willingness to pay for fish & wildlife)

Q = acre-feet of water transferred

MV_{rb} = marginal value of water in the receiving basin

MC_{eb} = marginal cost of water in the exporting basin

IM_{rb} = receiving basin income multiplier

MV_{eb} = marginal value of water in the exporting basin

MC_{eb} = marginal price of water in the exporting basin

IM_{eb} = exporting basin income multiplier

T = transportation cost

Σ = sum over all units of Q

and,

there is no greater $PV\Delta$ RNI possible from an alternate source

(b) The payment by the importing basin to the exporting basin is the **equivalent** of

[13] The examples presented in this report include recreation and fish and wildlife values, as measured by a willingness to pay calculation, in the income value to be shared among the regions.

[14] By definition the direct seller of transferred water is not among the losers.

income foregone in the exporting basin, plus 50% of the net change in combined regional income

$$PVPAY = Q^*\Sigma(MV_{eb} - MC_{eb}) * IM_{rb} + 0.5^* \Delta RNI \quad (2)$$

where

PVPAY = present value of future income foregone, plus 50% of Δ RNI

Alternative mechanisms may not go far enough to accomplish payment of income foregone and the sharing of net regional income gains, but none will require paying more than this amount. We define three classes of compensation alternatives:

1) **Class A** alternatives will achieve payment of income foregone and the sharing of net regional income gains;

2) **Class B** alternatives will achieve payment of only income foregone; and

3) **Class C** alternatives will achieve some form of public and/or private compensation in the form of cost sharing or subsidy that approximates the size of the income foregone, but ignores the sharing of net regional income.

The above three types of payment are identified in this study for several reasons. First, Class C alternatives are included because they are the most common in the historical cases, not only in Texas, but also in other states. This type of payment is intuitively attractive--if water is taken, compensation will be made with a water related payment. The City of Dallas, for example, paid the Sabine River Authority for water diverted out-of-basin by paying for the reservoir needed to impound the water located in the Sabine, a benefit to residents of the Sabine area because it also provided water and recreation benefits to local residents (example discussed below). Such "in-kind" payments may satisfy the three-part rule above in some cases, and certainly may be the easiest form of payment to arrange. As a general matter this method of compensation will fail to do a good job of matching payments with impacted groups, and water related developments in the basin of origin may be a very low priority of needs compared to other resources that the payment could buy. A water project may be the last thing the exporting basin needs.

Class B alternatives are included because they match payments with income that is given up, but do not go the extra step of providing net regional income sharing, and are therefore less complicated to administer. Under this type of payment, income equivalent payments could be made, rather than in-kind water project payments common to Class C payments, but there would be no sharing of net regional income gains. If there are net income gains equity would not be well served by Class B payments, but at least the impacted parties in the basin of origin would be compensated for their losses, and in a form of payment that could be used for their best benefit. As a general matter this alternative will be superior to Class C alternatives, but inferior to Class A.

Class A alternatives are included because they most clearly satisfy the three-part rule. Efficiency is achieved because the water is put to a higher valued use. Equity is served because impacted parties receive payment for the impacts in a form that can best serve their needs. Equity is served because the exporting basin gets to share in the net income gains due to the transfer. The receiving basin does not get to keep all of the net income gains.

Factors Considered in Defining Compensation Alternatives

The identification of available alternatives mechanisms for third-party compensation of interbasin transfers takes into account several issues, including:

(1) what will be the revenue source (tax, fee or state appropriations);
(2) who will implement a program of compensation;
(3) what are the types of impacts that are to be compensated;
(4) what kind of compensation form will be used (direct income payments to individuals and firms, cost sharing of certain costs, in-kind payments to the community, etc.), and
(5) whether net regional income is to be shared along with payments for impacts.

The definition of three classes of compensation takes into account alternatives by the kind of compensation and by the types of impacts that are to be compensated, including whether net regional income should be shared (Class A, B and C). The argument below concludes that fees are the best choice among available funding sources and five alternative entity/institutional arrangements are identified to carry out the program of compensation and the collections of fees or taxes (WDB as Broker, WDB as Broker/Buyer and Seller, River Authorities as Broker, Regional Water Planning Groups as Broker and New Entity as Broker).

There are six possible combinations of private and public entities that may be the primary parties to a transfer. It is most likely that future transfers will be purchases of raw water under long term contract by public entities from either public or private entities holding existing water rights. (There is a mix of raw and treated water in the current set of transfers. See Appendix E). There may also be some appropriations of unappropriated waters in East Texas, mostly by out-of-basin public entities. There have been cases in the past where water rights were sold to out-of-basin entities and such may certainly happen again, though it seems much less likely than the sale of raw water. The six possibilities are:

(1) Public sector purchase of a water right or water from a public sector water right owner
(2) Public sector purchase of a water right or water from a private sector water right owner
(3) Public sector appropriation of unappropriated water right

(4) Private sector purchase of a water right or water from a public sector water right owner
(5) Private sector purchase of a water right or water from a private sector water right owner
(6) Private sector appropriation of unappropriated water right

Private sellers can be taxed on the transfer; public entities are generally exempt from taxation and may need to make payments in-lieu of taxes if taxes are used to raise revenues. In every case it is likely that programs to distribute compensation payments will be carried out by public entities.

The fee or tax needs to be set on a case by case basis, at least for economic efficiency reasons, so that the purchaser faces the third-party impacts of the particular transfer. The public finance justification for the imposition of a fee is usually to pay for the cost of a public service provided by a government agency. Fees are also used as part of a business transaction such as oil and gas leases, land sales and property rentals. The principle to be followed in this type of fee is generally fair market value rather than the cost of supporting a particular activity (e.g. third-party compensation programs). It can be argued that Class B and C compensation rates per acre-foot of transferred water represents the part of the market price ignored in the exchange among the primary parties. (See Appendix A). That is, water exchanges between the primary parties in a purchase of water or water rights ignores third-party values of water use. In the event water rights are exchanged in a transfer, a reporting of actual takes of water will be needed as a basis for determining the fee. This may require special reporting since contracts for such a purchase will not specify annual quantities to be taken, and yet the third-party impacts are related to the quantity transferred.

The most common third-party impacts involve income and property values and fish and wildlife and related recreation opportunities. The major classes of impacts are:

(1) Property value loss by individuals and firms indirectly impacted
(2) Income loss by individuals and firms indirectly impacted
(3) Aesthetic value loss
(4) Property value loss by governments indirectly impacted
(5) Income loss by governments indirectly impacted
(6) Property value loss by individuals and firms directly impacted
(7) Income loss by individuals and firms directly impacted
(8) Property value loss by governments directly impacted
(9) Income loss by governments directly impacted
(10) Loss of fish and wildlife[15]
(11) Loss of recreational opportunities

[15] TNRCC imposes streamflow conditions that limit, but can not always prevent loss of fish and wildlife, in which case mitigation is required.

When Texas governments are assigned responsibility for making compensation payments, it will be most difficult of all for them to make direct payments to individuals for income and property value losses. Correctly designed legislation, however, can overcome the limitations.

The logical approach to choosing an institution to impose a fee or tax and carry out a program of compensation and/or net regional income sharing is to first examine existing institutions capable of carrying out the functions under existing law. Following that, it is logical to identify changes to the legal and regulatory system needed to have existing institutions able to perform the task. Finally, the creation of a new entity dedicated to the interbasin transfer issue is also an option.

The Texas Water Development Board operates the Texas Water Bank under authority granted by SB 1030 of the 73rd Legislature (1993).[16] The program has bonding authority to provide financial assistance to political subdivisions for construction of projects, which can include water rights purchases. Language in the statute provides the ability to act as broker in the transfer of water and water rights among willing buyers and sellers throughout the state. New authority to impose a compensation or transfer fee, own water and operate a compensation program would allow the TWDB to carry out the compensation of third-party impacts for water transfers. Such legislative authority would establish the program as a public purpose allowing direct payments. TWDB would be able to set up programs to make direct payments and/or subsidies of individual and firm water utility bills. TWDB would also be able to transfer funds to other agencies for fish and wildlife projects and water and wastewater project cost sharing. If adequate financing was available, TWDB would also be able to buy and sell water and water rights.[17]

The river authorities could also operate a brokering function, collect fees and operate compensation programs. Statutory authority would be needed to allow a compensation or transfer fee to be imposed, declare compensation for interbasin transfer to be a public purpose, and allow direct payments. The river authorities already have authority to develop water related projects within the basin; some have the ability to operate an economic development program. Existing legislation allowing river authorities who sell electricity to operate economic development programs could be modified to allow other river authorities to do the same, thus creating the ability to provide general economic growth benefits to the basins.

The recently created Regional Water Planning Groups (RWPG) could be given the tasks of imposing compensation or transfer fees and operating compensation programs. All of the powers mentioned in the previous paragraphs would be needed to allow these entities to complete the tasks. Since the RWPG boundaries do not always follow river basin boundaries, and do not encompass all of a given river basin, these

[16] U. T. C. A., Water Code §15.701 - §15.708, New Subchapter K.

[17] Note: SB 991 was passed by the 76th Legislature and signed by the Governor Bush. It gives more authority to TWDB to own water that can be transferred.

entities do not seem to be good candidates. Further, they do not have staffs to provide the needed staff support. But the current regional planning process under SB 1 is creating new consensus-building political groups that could be restructured to accomplish the third-party compensation tasks.

The last option is to create a new entity to focus only on the interbasin transfer problem and the collection of fees and operation of compensation programs. The advantage of this approach would be the lack of built-in conflicts of interest within the agency.

Guiding Principles for Adopting the Best Compensation Mechanisms

A well designed set of mechanisms for payment of third-party impacts will assure economic efficiency and equity. Economic efficiency requires that the importer face the full cost of transferring the water, including third-party impacts, otherwise he will under value the water, using more than well functioning markets would dictate, and perhaps importing water that should not be imported. Aggregate income from the use of water resources in the two regions will be maximized if this rule is respected. Efficiency will be promoted if third parties are compensated in terms **equivalent** to the income values lost due to the transfer, rather than in terms of subsidies or cost sharing, but such an approach will be more difficult to administer than a system of in-kind payments.

Equity requires that the mechanism promote equal treatment among interest groups. Equity also requires that the receiving basin share net income gains from the transfer with the exporting basin. The adoption of equity rules that require such sharing of benefits will also help assure that there is an incentive for the exporting basin to agree with a proposed transfer even though it is not possible to precisely compensate all losers.

In order to achieve efficiency and equity third-party payments must match the time of payment with the time of the impact, or make appropriate adjustments so as to achieve an equivalent result through the use of discounting of future income streams.

Some desirable compensation mechanisms may be unconstitutional or inappropriate under state laws that guide public finance. The chosen set of mechanisms should be legally defensible--that is, they should stand the test of court challenges.

Finally, the set of mechanisms should be flexible. That is, the mechanism will need to accommodate different magnitudes of payments to third parties, and to be able to match the timing of impacts with payments, or to be able to provide the equivalent value through discounting. This means the entity making payment needs to have the ability to issue bonds (borrow money). The mechanism needs to include taxing authority that allows tax rates or fees to be set to match the payment requirements for third-party impacts. Also, the mechanism should be applicable to both private sector and public sector transactions. If the party transferring the water is a private party then the entity can be taxed. If the transferring entity is a public entity, state law generally exempts

governments from taxation. The use of a fee rather than a tax will usually allow governments to pay without an in-lieu-of-tax statute. Therefore, the mechanism needs to allow payments in lieu of taxes by units of government that are primary parties to the transfer, or use a fee to raise revenue.

IV. Examples of Existing Third-Party Compensation

As resources are extracted and moved from one region to another the resources once used by individuals in the exporting region are no longer available for use. Parties directly involved in the transaction are compensated, the seller receives payment and the buyer receives the resource. Parties that enjoy the benefits of the resource but do not have a direct claim on them are usually left out of the transaction. Compensation for these "third-parties" can be problematic. However, the states have dealt with the question of third-party compensation to varying degrees.

The idea of compensation in exchange for the value of opportunities foregone[18] to enhance economic gain for the whole is not new. There are notable examples of applying such mechanisms in the transfer of water in Texas and elsewhere in the West, as well as the exercise of such practices in other natural resource allocation problems.[19] The examples below are grouped by Class A, B, or C compensation. Class A means the compensation is of an income equivalent payment and includes payment for sharing net regional income gains as well as payments for the direct loss of income. Class B is the same as Class A except that net income gains are not shared. Class C, the most common type found in the literature, provides some kind of indirect payment not directly matched to those suffering income loss, and ignores any sharing of net regional income gains. Class C examples usually amount to payment by the receiving basin in the form of partial or complete provision of a water related project constructed in the basin of origin--a form of water for water service trade.

Class A Compensation Examples

The Pyramid Lake Paiute Tribe in the State of Nevada settled ongoing issues of water transfers through omnibus legislation passed by the 101st Congress at the end of its 1990 session, Public Law 101-618. For years water had been transferred from the Pyramid Lake basin, away from the traditional uses of the tribe. The settlement included an economic development fund of $40 million, established for the tribe, for the settlement of water, fish, and other issues. Another fund of $25 million was established for the Pyramid Lake fishery. This is an example of Class A, or perhaps Class B compensation,

[18] The value of the opportunity foregone is often referred to by economists as "opportunity cost". The idea is that every economic choice or decision involves giving up or "foregoing" some other choice. The value of such next best choice is the cost of choosing the best option. Since economic resources, such as water, are scarce, to make use of it for one purpose is to forego another. We have to know the value of what is foregone before we know that the selected option is the best, and the foregone value can be paid for by the value of the selected option or else the decision is not economically rational.

[19] Water is somewhat unique among natural resources concerning the need for third party compensation to achieve economic efficiency in that other resources traded in ordinary ways as market commodities do not have third parties; the only significant parties affected by a trade are the two primary parties. In the case of surface waters there are usually always downstream parties able to make beneficial use of the water returned to the river by primary upstream users. They are adversely affected by the upstream user's agreement to transfer the water out of basin.

depending, respectively, on whether the payments included sharing of net regional income gains or only direct income losses.

The Pyramid Lake project is a good example of the high transactional cost and uncertainty involved in handling each case through legislation. An established methodology that certifies the appropriate compensation as part of the TNRCC hearing process would formalize the procedure and keep the cost and uncertainty low by comparison.

A case where potential impacts on property values was to be compensated in a non-water-resource case involves a low-level radioactive waste disposal facility in the State of Illinois. The State developed a mechanism to guarantee property values of private land owners. Adjacent property owners were guaranteed that upon sale of their property the state would either purchase the property at market prices presumed to prevail without the site influence, or make up the difference between the sales price and the expected market price without the disposal facility.

Class B Compensation Examples

A private sector case in Texas involves a program of payment to impacted parties resulting from extensive groundwater pumping to "de-water" a lignite mine by Alcoa in Milam County. The program is Alcoa's response to the Federal Surface Mining Act requirement for mediation of impacts. Water benefits foregone are compensated by expanding the pumping capacity of the impacted party at Alcoa's expense, and in the event such remedies cannot be accomplished, compensating the party with direct payments.

The State of New York took action to protect its rural communities by limiting New York City's taking of land in upstate counties for its water system unless full compensation is paid. In New York the cost of diversion is made even greater by a statutory provision which, in addition to allowing compensation to the owners of riparian land, requires that the owner of any real estate directly or indirectly decreased in value by the execution of any plans for additional water supply to have the right to recover damages for such decrease in value. This provision guarantees compensation to nonriparians who have made use of the river, as well as to business and property owners whose values are diminished simply by the fact that the use of the river is affected.[20]

Class C Compensation Examples

The Lake Fork project in northeast Texas involved a long-term contract to have the City of Dallas (originally, Texas Utilities) make debt service payments of approximately $10 million per year to repay the bonds issued by the Sabine River Authority (SRA) to construct the project, in exchange for the out-of-basin transfer of 120,000 acre-feet of water per year. The transferred quantity amounts to 72.8% of the

[20] Joseph L. Sax, *Water Law, Planning and Policy*, Bobbs-Merrill, 1968, p. 200.

firm yield of the reservoir of 164,940 acre-feet. Beginning in year 2014 the contract automatically renews perpetually for 50 years at a time, but the price at this point will have to be determined by the parties. This project is an example of a compensation mechanism we call "payment in-kind". The City of Dallas, at least until year 2014, pays for the full cost of the project in exchange for 72.8% of the firm yield of the reservoir. This is a Class C compensation example since the basin of origin (SRA) receives compensation that will benefit the businesses and residents of the Sabine River Basin through the development of firm yield water of 44,940 acre-feet per year that will be available for beneficial use in-basin for only the cost of O&M. No attempt has been made to match income foregone with income payments associated with the transfer of 120,000 acre-feet out-of-basin (Class B compensation), nor is any payment made to share net regional income gains (Class A compensation).

The Lake Tawakoni project in northeast Texas involved the sale of 80% of the water right to the firm yield of the reservoir in exchange for payment from the City of Dallas for the bond payments to construct the project. The Dallas water right is for 258,100 acre-feet per year out of a total yield of 190,480 acre-feet per year or 80% of the firm yield. In addition, Dallas pays a proportional share of the O&M cost of the project. This is also an example of a Class C compensation project since the basin of origin (SRA) receives compensation that will benefit users in the basin of origin by providing 47,620 acre-feet of firm water supply for beneficial use for only the O&M cost. The payment arrangement is not directly calculated to pay for third-party impacts (Class B compensation), or to share net regional income (Class A compensation).

Another interbasin transfer involving in-kind compensation is that of the so-called "Devers Case". Devers Canal System, as a division of Trinity Water Resource, Inc., in bankruptcy proceedings in the early 1990s sold its assets, including its Trinity River Basin water rights to the San Jacinto River Authority for Houston area water supply, thus transferring water rights from the Trinity River Basin to the San Jacinto Basin. Under protest by irrigators who depend on Trinity River water from Devers Canal System, agreements were reached to retain water flows for irrigation use in the Trinity, leaving a net transfer of 50,000 acre-feet. That is, the transfer of the water right and associated diversion places and rates were modified to allow irrigation to continue by farmers who would otherwise have been severely impacted. This "mitigation" of direct damages to the third-party irrigators who were customers of Devers avoided significant third-party impacts in the Trinity. It is unclear whether there were other third parties left uncompensated, but this is another example of Class C compensation.

The current groundwater law as amended by SB 1, allows underground water districts to impose a transport fee on the out-of-district movements of water. The fee in the case of the Barton Springs/Edwards Underground Water District was set to cover the cost of a number of projects designed to improve water conditions within the district. The case was the transport of water to the City of Kyle from wells drilled by the City on land purchased inside the District. This fee amounts to a third-party payment to some degree because it benefits everyone in the district that relies on groundwater of good

quality. The primary parties got their payments through the sale of the land and its water right.

A 1943 Colorado law requires the diversion facilities for conservancy district projects taking water out of the Colorado River basin to incorporate features that will protect present and future consumptive water uses in that basin and that will not increase the cost of that water. The practical effect of this provision has been to cause the importing conservancy district to build additional storage reservoirs on the West Slope to provide "compensatory storage" for use in this area. As a result of the Colorado Big Thompson Project, Green Mountain Reservoir was built to provide water needed to protect West Slope interests. The purposes to be achieved by the reservoir are:

1) To preserve the vested and future rights in irrigation
2) To preserve the fishing and recreational facilities and the scenic attractions of Grande Lake, the Colorado River, and the Rocky Mountain National Park.
3) To preserve the present surface elevations of the water in Grande Lake and to prevent a variation in these elevations greater than their normal fluctuation.
4) To so conserve and make use of these waters for irrigation, power, industrial development and other purposes, as to create the greatest benefits.
5) To maintain conditions of river flow for the benefit of domestic and sanitary uses of this water.

Other conditions of the agreement provided that an irrigation system for meadow lands in the vicinity of Kremmling be provided, that domestic water supplies of Kremmling and Hot Sulphur Springs would be protected and that Grand County would be paid $100,000 for estimated loss of tax revenues from the lands to be inundated as a result of the reservoir. This is a Class C compensation example, although the payment of lost tax revenue is a Class A compensation example.

A more recent example of compensation problems as a result of interbasin transfers in Colorado is the Windy Gap project. This was a totally private project. Once again water was being transferred form the West Slope to East Slope municipalities. Negotiations between the representative parties began in December, 1979. Concerns about possible increases in salinity were addressed by paying Grand County $25,000 to conduct salinity studies; concerns by the Town of Hot Sulphur Springs about its water supply and sewage systems were met by payments of $150,000 for improvements to its water treatment facility and $270,000 for improvements in its waste water treatment facility; concerns by the U.S. Fish and Wildlife Service and the Colorado Division of Wildlife regarding potential adverse impacts on fish were addressed by guaranteeing certain minimum streamflows below the reservoir site and donating $550,000 for work to protect two species of endangered fishes.

California has also addressed the problem of compensation when it was developing its State Water Project. The Burns–Porter Act, was passed in 1959, provided funding for the project. The related Davis–Grunsky Act contained several provisions intended to compensate Northern California for the loss of water. One form of compensation was funding for local needs including flood control. In addition, the Davis–Grunsky Act established a grants program for recreation and fish enhancement and a loans program for small projects and rehabilitation of domestic water systems. Also of concern to the Legislature of 1959 was the protection of the Sacramento – San Joaquin Delta. The Delta Protection Act looked to protect the agricultural, industrial, urban, and recreational interests that depended upon its waters. California's experience with the Drought Water Bank of the early 1990's has once again raised concern over compensating third-parties. Although the benefits of transferred water were greater than the costs, these benefits mainly accrued in cities in Southern California while the costs were borne by businesses and individuals "forward" and "backward" linked to the agricultural sector.[21]

One characteristic common to all of the above examples is that compensation was attained on a case by case basis, not as a result of codified legislation. This does not make the examples any less relevant, however it does possibly demonstrate the difficulty in addressing third-party impacts from water transfers.

A project that does not address third-party impacts directly but is of interest to this study is the purchase of groundwater in Roberts County, Texas. This will entail transferring water not only out of district but eventually out of basin. For a number of years the water in Lake Meredith has slowly increased its level of chlorides making the water "saltier." To counteract this problem for its member cities the Canadian River Municipal Water Authority (CRMWA) has begun a project to bring the quality of delivered water up to the State Drinking Water Standards. The project involves mixing groundwater with the lake water.

Water rights will be acquired on 42,765 acres located in Hutchinson and Roberts Counties in the Texas Panhandle. It is estimated that approximately two million acre-feet of water is in place within this area. However the Panhandle Underground Water Conservation District No. 3 has issued a permit allowing up to 40,000 acre-feet of water per year to be withdrawn under normal circumstances, and up to 50,000 acre-feet in emergency conditions.

The infrastructure will initially consist of a field of 29 wells which will produce enough water to allow blending with Lake water at up to a 40% ratio. A collection

[21] Economic transactions among industry types may be thought of as a chain of transactions from one industry to another until a basic product becomes a final product for consumers. Such chains of exchanges are referred to as either selling "forward" to industries which buy the products as input to their own production process (forward linkages), or buying "backward" from industries that sell their products as inputs to the current industry's production process (backward linkages).

system of pipelines will bring the water from the wells to a central collection point. From this central collection point an aqueduct will bring the well water to the existing aqueduct that now transports water from the Lake Meredith to the user cities. Water from the wells will be blended with the lake water to produce an acceptable quality.

As a result of mixing the groundwater with lake water, water supply will increase. Each city would be entitled to receive the same percentage share of the available water supply as under the existing contracts. The only exception is that Pampa will only receive 3.6% (instead if 7.163%) of the groundwater supply and Amarillo will receive 40.6215% (instead of 37.058%). Water from Lake Meredith will be used to the maximum extent possible which will conserve the non-renewable groundwater resource, and maintain the lowest overall cost of water to the Authority's member cities. In most cases, the availability of groundwater will not increase the *rate of delivery* of water which each city can receive, but the *total quantity which can be made available* will be increased. The *rate of delivery* is constrained by the capacity of the infrastructure.

The agreed price for the water rights is $14.5 million. The initial cost of the well field (29 wells) is estimated at $24.7 million and the construction cost of the new aqueduct is estimated at $40.7 million. If the well field needed to be expanded it would cost another $8.9 million. The allocation of costs to the member cities will be based on the water supply allocations and the facilities needed to deliver water on behalf of that city. Based on the number of acres purchased it was found that the price paid per acre, on average, was $339. This figure is comparable to what the individual cities are paying for groundwater rights. Given that there is an estimated two million acre-feet of groundwater the price paid per acre-foot of water is $7.25 in the aquifer, or perhaps $15 at the surface. Currently the Panhandle Groundwater Conservation District is not charging a pumping fee or fee for the transport out of district.

This current project has raised concerns amongst citizens of Roberts County. In the past they had been reluctant to join the Panhandle Groundwater Conservation District for fear that it would exert unwanted controls upon them. But when this current project began to take shape with the prospect of the groundwater flowing as far as 220 miles south they changed their minds and joined the conservation district in 1994. A compromise was worked out between the Authority and conservation district for the withdrawal rates mentioned earlier. There are apparently no third-party payments taking place in the transfer.

A non-water resources example on the issue of low-level waste disposal in the State of Texas provided compensation in the form of payments to local governments to pay for public services and equipment for the community that would be host to the State disposal facility.

V. Alternative Revenue and Compensation Mechanisms

Third parties are of two classes. The first class is the set of parties who can identify direct impacts due to the water transfer. This group will be able to identify property value or income declines directly related to the water transfer. The second class is a diverse set of parties who are impacted indirectly but who can not establish a direct link to the transferred water. Different statutory powers and legal capacities are required to be able to pay third-party impacts to the two groups.

As a general matter direct payments to impacted parties are difficult to arrange in Texas because of constitutional prohibitions. Article 3, section 51 and article 16, section 6 of the Texas Constitution prohibit Texas governments from making direct grants on behalf of individuals, paid solely out of state funds, unless such payment serves a proper public purpose.[22]

This prohibition may require that any third-party direct payment related to interbasin transfer needs to be authorized by a new statute defining interbasin transfer as a public purpose. Without such statutory definition, it will not be possible to make direct payments to individuals for income or property value impacts, regardless of how clearly impacted they are. It may be, however, that existing sections of the Water Code can be interpreted as a statement of public purpose for interbasin transfers.

The only options for payment for third-party impacts in the absence of statutory provision of a public purpose definition is to allow funds to flow to entities with economic development or employment training program responsibilities who would be able to provide very general economic benefits to the basin of origin. Such benefits would generally be of the form of information and advice for new or expanded business ventures, coupled with public sector projects, and perhaps employment training.

Legislation clearly establishing interbasin transfer as a public purpose will allow direct payments, as well as more generalized public sector projects to be implemented as payment for third-party impacts to the parties who can identify direct impacts due to the water transfer. It may be, however, that SB 1 can be so interpreted thus avoiding the need for statutory changes.

The most likely parties of such impacts are farmers and backward and forward linked businesses in agricultural areas[23] and (in surface water cases) property owners of certain lakeside properties.[24] The agribusiness and lakeside property owners can not be compensated very well by the provision of public sector projects and services.

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[22] Tex. Atty. Gen. Opinion No. MW-22, May 18, 1979

[23] It is clear that agriculture will be generally the most impacted party since agriculture is by and large the "marginal valued" user of water for irrigation, and will in the final analysis be the source of water transferred to other basins.

[24] Lake side property owners' property values are related to the lake levels maintained by the lake operator. Lake levels are necessarily variable as withdrawals are made to satisfy firm water right holders and for downstream releases for maintaining minimum streamflows and to satisfy interruptible demands for irriga-

If direct payments can not be made, the options for matching payments with impacts are very limited. The entire compensation program will necessarily be made up of public projects and/or services. Such payments could fund 1) information services about recreation and business opportunities, 2) cost-sharing for water and waste water facilities, 3) cost sharing for water conservation programs, 4) cost-sharing for improving parks and recreation facilities, 5) cost sharing for improving waste disposal facilities to maintain or improve groundwater and surface water quality and 6) provision of public services less directly tied to water and waste water such as police and fire protection equipment and public school facilities.

The provision of such public service facilities and services can be more or less matched with impacts by geographical location within the basin. The weakness of this approach is that the distribution of payments among impacted parties can not be matched well with many of the most pronounced impacts. Further, if payment is made by constructing public projects, or even by subsidizing the cost of water and waste water utility bills to individuals and businesses, the benefits will not be matched with incomes foregone.

Revenue Sources

Third-party payments will have to be funded by a tax or fee placed on water transferred interbasin. The other unlikely alternative is direct state appropriations from the state general revenue fund.[25]

A tax or transfer fee could be imposed by either an appropriate unit of regional government or by the state of Texas. Legislation and perhaps changes to the state constitution would be needed to authorize such a tax or fee.[26]

The size of the tax or fee could be more easily tailored to match the third-party impacts if set by a regional government. Since the size of third-party impacts will vary considerably among river basins, a state-wide fee will not allow costs to be imposed on the right users.

If the state imposes a tax the laws will most likely require a uniform tax to be applied state-wide, meaning that the importing basin in a particular region would not necessarily face the full third-party costs imposed by its particular transfer. While a

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tion. If a transfer of firm water out of basin increases the variability of the lake levels due to the loss of return flows, relative to that which would occur from a firm sale in-basin, then lakeside property may be impacted.

[25] Since there are more than 80 existing interbasin transfers in Texas, it is likely that these would need to be exempt from any new tax. Exemption seems appropriate since it is unlikely that these transfers have significant third party impacts and therefore, would not have to pay any taxes even if included under a new law.

[26] An important issue is whether a tax or a fee is better suited to the problem. This topic is discussed in Appendix A of the report.

similar problem exits for local governments when large differences exits among transfers within the same basin, it is likely that more uniformity exists within basins than among basins.

Existing Institutions for Implementing Third-party and Net Regional Income Share Payments

There are several existing institutions that could perform all or parts of the tasks of identifying and certifying impacted third parties and administering appropriate distributions of payments. There is, of course, the option to resolve third-party issues by special legislation for each transfer. This is often the means of resolving major conflicts. Hopefully, legislative guidelines and statutory authority can be developed to make the resolution of such matters more routine, thus encouraging needed interbasin transfers.

The TNRCC has already developed rules that accommodate consideration of third-party impacts in § 288.7.[27] If Class A alternatives are developed, these rules would need modification to allow inclusion of net regional income sharing. The entity charged with the responsibility for carrying out a program of third-party payments and net regional income sharing would need to become a party to the TNRCC proceedings to approve a Certificate of Appropriation or Amendment for interbasin transfer so that third-party impacts and net regional income sharing get included in the proceedings.

There are several existing institutions and programs, given appropriate statutory authority that could be useful in implementing a third-party compensation and net regional income gain sharing program. The Water Bank operated by the Texas Water Development Board (TWDB) could serve as a repository of state purchased water rights to be resold to water deficit areas after adding the costs of third-party impacts and a share of net regional income gains. Or, more likely the Water Bank could serve as a mechanism to help bring buyers and sellers together by adding the capability for assessing and making third-party impact payments (Class A, B or C). Payments from a state program run by the Board could include direct payments, property value guarantees, government service and facility cost sharing and contracts for local governments to operate economic development and employment training programs. The Board could, more easily than most, operate a consistent set of state-wide programs, designate geographical areas of the exporting basin for specific public sector projects, etc. Legislation would be needed to provide statutory authority.

The Texas systems of river basin authorities are the other major entities able to implement Class A, Class B or Class C compensation programs, given appropriate statutory authority. All of the river authorities would be able to do Class C programs because they already have statutory authority to issue bonds and carry out water related functions and projects. The river authorities with electric sales would be able to compensate through economic development programs under current statutory authority. All of the authorities would need authorization to impose fees to fund the programs

[27] Rules to implement Senate Bill 1 (1997), TNRCC, Chapters 288, 293, 294, 295 and 296.

though they would probably be able to receive funds from a fee or tax imposed by a state government entity without changes to statutory authority.

Existing economic development and employment training agencies would be the most likely entities to operate economic development and job training programs of grants, loans and conservation programs that will likely make up a large share of a Class A compensation program. Some river authorities have active economic development programs under a recent Texas statute allowing river authorities that sell electric power to operate such programs.[28] Municipalities and city- and investor-owned utilities also operate economic development programs that could be used (via contract) to implement the economic development part of the compensation program. Regional job training committees have recently been formed to plan and develop job training programs.

One option for implementing direct payments to farmers and related agri-businesses may be a cooperative agreement with the Texas Department of Agriculture to carry out a program of direct payments to farmers since they already have systems established to deliver various programs to farmers and agribusinesses. Another option would be to do the same through cooperative agreements with Federal agricultural agencies that already make direct payments to farmers.

There is no current program to make payments to property owners for the devaluation of property values. If such payments are authorized for lake side property owners, a special program and related contingency fund would have to be designed. One possibility is to amend the property tax code to allow tax exemptions for qualifying devalued property, thus providing an equivalent income value without making direct payments. Such a mechanism might also be used, as an alternative to direct income payments, to compensate agricultural land owners who suffer farm value decreases due to loss of irrigation water. The loss to the taxing jurisdiction would be off set by public sector projects that reduce the future need for local taxes and/or payment for lost tax revenues.

Alternative Mechanisms

Given the revenue alternatives and existing institutional arrangements by which compensation payments can be made there are several alternative mechanisms for achieving the desired ends. Statutory and/or regulatory changes will be needed in varying degrees. Each alternative is described in terms of completing Class A, B and C compensation programs.[29]

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[28] Art. 717p authorizes river authorities that engage in the distribution and sale of electric energy to the public and that generates at least an annual average of 55 million kilowatt hours of electric energy to engage in an economic development program. This provision would have to be changed to make this option available to all river basins in the State.

[29] Class A, B and C alternatives are discussed in each case because, although Class A will better serve the criteria for encouraging interbasin transfers identified in this study, it is also the most administratively difficult of the three type, and will require more legislative changes than Class B and C. Class C is the easiest to implement but the poorest of the set in terms of achieving good matches of impacts with payments.

I. Expand the Role of the Texas Water Bank to Broker Interbasin Transfers

TWDB is already able to perform a broker function in the exchange of water rights and/or water under wholesale contract, among two or more river basins. Payments for the water or water rights under such functions are exchanged between the primary parties. TWDB is already able to estimate third-party impacts, and under Class A type compensation, the net regional income gain due to the transfer, and negotiate an agreement on the compensation terms with the primary parties to the transfer. Some new authority would be needed to carry out the taxation of transfers and the operation of a compensation program.

a. specify and impose a compensation fee to be paid to the Water Bank by the importing basin to accommodate the negotiated compensation -- fee to be approved in the change of permit hearing at the TNRCC (statutory authority needed).

b. design a set of compensation programs to be funded by the compensation fee, utilizing some or all of the following, as appropriate (statutory authority needed):

A. Class A Compensation (income equivalent payments of impacts and net regional income gain sharing)
   (1) direct income payments and/or grants, loans and loan guarantees to farmers
   (2) grants, loans and loan guarantees to agricultural suppliers and processors directly linked to irrigated agriculture
   (3) property value guarantees to lakeside property owners through price guarantees at the time of sale, or through appraisal adjustments to reduce property tax payments
   (4) funding of fish and wildlife enhancement projects through the programs of the Texas Parks and Wildlife Commission and/or the River Authority
   (5) funding of recreation projects through the Texas Parks and Wildlife Commission
   (6) funding of economic development programs of the River Authority and/or municipal/county economic development programs
   (7) funding of employment training programs of the Regional Workforce Development Board

B. Class B Compensation (income equivalent payments of impacts)
   (1) direct income payments and/or grants, loans and loan guarantees to farmers
   (2) grants, loans and loan guarantees to agricultural suppliers and processors directly linked to irrigated agriculture

(3) property value guarantees to lakeside property owners through price guarantees at the time of sale, or through appraisal adjustments to reduce property tax payments
(4) funding of fish and wildlife enhancement projects through the programs of the Texas Parks and Wildlife Commission and/or the River Authority
(5) funding of recreation projects through the Texas Parks and Wildlife Commission

C. Class C Compensation (in-kind payments only)
(1) fund the replacement of the water resource with an alternative (e.g. payment for groundwater rights and pumps to replace transferred surface water and developing conservation programs and technologies)
(2) fund the development of water and wastewater facilities in the impacted communities (needed water and wastewater treatment plants, wetlands enhancement, drainage canals, etc.) as identified by the River Authority
(3) transfer funding to the River Authority, Subsidence District and/or set of groundwater districts to use according to their mission and priorities
(4) credit business and residential utility bills in the impacted areas by a transfer of funding to the water utility

Some of the statutory authority already exists under Senate Bill 1030 and Senate Bill 1 to carry out this alternative. There may be a need to pass legislation to make it clear that compensation (defined as either Class A, B or C) for interbasin transfers is a public purpose and that the imposition of a tax or fee for such purpose is appropriate. The ability to impose a compensation tax or fee for the purposes defined would need statutory authority. TNRCC rules for approving an interbasin transfer already exists and allows an unspecified compensation payment to be part of the hearing for the approval of a permit to appropriate or change an existing water right. Statutory authority would be needed for making direct payments to businesses and individuals under Class A and Class B compensation, but probably only appropriation authority under Class C compensation.

II. Expand the role of the Texas Water Bank to Include the Ability to Use Bond Money to Buy and Sell Water and Water Rights

a. allow TWDB to buy and sell water and water rights on an individual transfer basis, adding the appropriate compensation fee to the cost of purchase upon completion of the sales terms to the buyer (statutory authority needed).
b. assign TWDB the task of estimating the third-party impacts, and under Class A type compensation, the net regional income gain due to the transfer, and negotiate an agreement on the compensation terms with the

primary parties to the transfer (statutory authority needed).

c. specify and impose a compensation fee to be paid to the Water Bank by the importing basin to accommodate the negotiated compensation -- statutory authority would be needed to impose a fee and the fee would be approved in the change of permit hearing at the TNRCC

d. design a set of compensation programs to be funded by the compensation fee, utilizing some or all of the following, as appropriate (statutory authority needed):

A. Class A Compensation (income equivalent payments of impacts and net regional income gain sharing)
   (1) direct income payments and/or grants, loans and loan guarantees to farmers
   (2) grants, loans and loan guarantees to agricultural suppliers and processors directly linked to irrigated agriculture
   (3) property value guarantees to lakeside property owners through price guarantees at the time of sale, or through appraisal adjustments to reduce property tax payments
   (4) funding of fish and wildlife enhancement projects through the programs of the Texas Parks and Wildlife Commission and/or the River Authority
   (5) funding of recreation projects through the Texas Parks and Wildlife Commission
   (6) funding of economic development programs of the River Authority and/or municipal/county economic development programs
   (7) funding of employment training programs of the Regional Workforce Development Board

B. Class B Compensation (income equivalent payments of impacts
   (1) direct income payments and/or grants, loans and loan guarantees to farmers
   (2) grants, loans and loan guarantees to agricultural suppliers and processors directly linked to irrigated agriculture
   (3) property value guarantees to lakeside property owners through price guarantees at the time of sale, or through appraisal adjustments to reduce property tax payments
   (4) funding of fish and wildlife enhancement projects through the programs of the Texas Parks and Wildlife Commission and/or the River Authority
   (5) funding of recreation projects through the Texas Parks and Wildlife Commission

C. Class C Compensation (in-kind payments only)

(1) fund the replacement of the water resource with an alternative (e.g. payment for groundwater rights and pumps to replace transferred surface water and developing conservation programs and technologies)
(2) fund the development of water and wastewater facilities in the impacted communities (needed water and wastewater treatment plants, wetlands enhancement, drainage canals, etc.) as identified by the River Authority
(3) transfer funding to the River Authority, Subsidence District and/or set of groundwater districts to use according to their mission and priorities
(4) credit business and residential utility bills in the impacted areas by a transfer of funding to the water utility

The Class A, B and C compensation methods would be the same as in I.

III. Expand the Role of River Basin Authorities

a. allow the river authorities to broker the exchange of water rights and raw water under contract from the basin of jurisdiction to a neighboring basin.
b. assign river authorities the task of estimating the third-party impacts, and under Class A type compensation, the net regional income gain due to the transfer, and negotiate an agreement on the compensation terms with the primary parties to the transfer (statutory authority needed)..
c. specify and impose a compensation fee to be paid to the river authority by the importing basin to accommodate the negotiated compensation -- fee to be approved in the change of permit hearing at the TNRCC (statutory authority needed)..
d. design a set of compensation programs to be funded by the compensation fee, utilizing some or all of the following, as appropriate (statutory authority needed).

A. Class A Compensation (income equivalent payments of impacts and net regional income gain sharing)
(1) direct income payments and/or grants, loans and loan guarantees to farmers
(2) grants, loans and loan guarantees to agricultural suppliers and processors directly linked to irrigated agriculture
(3) property value guarantees to lakeside property owners through price guarantees at the time of sale, or through appraisal adjustments to reduce property tax payments
(4) funding of fish and wildlife enhancement projects through the programs of the Texas Parks and Wildlife Commission and/or the River Authority
(5) funding of recreation projects through the Texas Parks and

Wildlife Commission

(6) funding of economic development programs of the River Authority and/or municipal/county economic development programs

(7) funding of employment training programs of the Regional Workforce Development Board

B. Class B Compensation (income equivalent payments of impacts

(1) direct income payments and/or grants, loans and loan guarantees to farmers

(2) grants, loans and loan guarantees to agricultural suppliers and processors directly linked to irrigated agriculture

(3) property value guarantees to lakeside property owners through price guarantees at the time of sale, or through appraisal adjustments to reduce property tax payments

(4) funding of fish and wildlife enhancement projects through the programs of the Texas Parks and Wildlife Commission and/or the River Authority

(5) funding of recreation projects through the Texas Parks and Wildlife Commission

C. Class C Compensation (in-kind payments only)

(1) fund the replacement of the water resource with an alternative (e.g. payment for groundwater rights and pumps to replace transferred surface water and developing conservation programs and technologies)

(2) fund the development of water and wastewater facilities in the impacted communities (needed water and wastewater treatment plants, wetlands enhancement, drainage canals, etc.) as identified by the River Authority

(3) fund river authority's program according to the authority's mission and priorities, and/or transfer funding to the Subsidence District and/or a set of groundwater districts to use according to their mission and priorities.

(4) credit business and residential utility bills in the impacted areas by a transfer of funding to the water utility

Statutory authority will be needed to allow river authorities to (1) impose the compensation fee, (2) expand the number of river authorities who are able to operate economic development programs and (3) allow direct payments to business and individuals under Class A and Class B Compensation. Existing authority is adequate to carry out enhanced water related functions, funded by the compensation fee under Class C Compensation, except for the use of a utility bill credit mechanism for payments. A statutory declaration of compensation for interbasin transfer to be a public purpose, and the ability to impose the fee would be needed to exercise this mechanism. Further, a

statute would be needed authorizing the imposition of the fee also proclaiming compensation (defined as either Class, B or C) for interbasin transfers to be a public purpose and that the imposition of a fee for such purpose is appropriate.

IV. Expand the Role of the Regional Water Planning Groups (RWPG) to Carry Out a Compensation Program

a. allow the set of 16 regional planning groups to broker the sale of water rights and raw water under contract among regions where interbasin transfers are needed from the region.

b. assign the RWPG the task of estimating the third-party impacts, and under Class A type compensation, the net regional income gain due to the transfer, and negotiate an agreement on the compensation terms with the primary parties to the transfer.

c. specify and impose a compensation fee to be paid to the RWPG by the importing basin to accommodate the negotiated compensation -- fee to be approved in the change of permit hearing at the TNRCC.

d. design a set of compensation programs to be funded by the compensation fee, utilizing some or all of the following, as appropriate.

A. Class A Compensation (income equivalent payments of impacts and net regional income gain sharing)

(1) direct income payments and/or grants, loans and loan guarantees to farmers

(2) grants, loans and loan guarantees to agricultural suppliers and processors directly linked to irrigated agriculture

(3) property value guarantees to lakeside property owners through price guarantees at the time of sale, or through appraisal adjustments to reduce property tax payments

(4) funding of fish and wildlife enhancement projects through the programs of the Texas Parks and Wildlife Commission and/or the River Authority

(5) funding of recreation projects through the Texas Parks and Wildlife Commission

(6) funding of economic development programs of the River Authority and/or municipal/county economic development programs

(7) funding of employment training programs of the Regional Workforce Development Board

B. Class B Compensation (income equivalent payments of impacts

(1) direct income payments and/or grants, loans and loan guarantees to farmers

(2) grants, loans and loan guarantees to agricultural suppliers and processors directly linked to irrigated agriculture

(3) property value guarantees to lakeside property owners through price guarantees at the time of sale, or through appraisal adjustments to reduce property tax payments
(4) funding of fish and wildlife enhancement projects through the programs of the Texas Parks and Wildlife Commission and/or the River Authority
(5) funding of recreation projects through the Texas Parks and Wildlife Commission

C. Class C Compensation (in-kind payments only)
(1) fund the replacement of the water resource with an alternative (e.g. payment for groundwater rights and pumps to replace transferred surface water and developing conservation programs and technologies)
(2) fund the development of water and wastewater facilities in the impacted communities (needed water and wastewater treatment plants, wetlands enhancement, drainage canals, etc.) as identified by the River Authority
(3) transfer funding to the River Authority, Subsidence District and/or set of groundwater districts to use according to their mission and priorities
(4) credit business and residential utility bills in the impacted areas by a transfer of funding to the water utility

Statutory authority, modifying the provisions of SB 1 to expand the role of the regional planning groups would be needed. The changes would need to clearly identify compensation (defined as Class A, B or C) for interbasin transfer as a public purpose, and authorize the RWPG to have the power to impose a compensation fee. Further, in order to be able to carry out Class A and B compensation programs, statutory authority would be needed for making direct payments to businesses and individuals. The RWPGs would, of course, need staffing and appropriations to be able to carry out such functions. These are unlikely choices because of their limited role in water planning, but are included here for completeness.

V. Create a New Entity to Carry Out a Compensation Program

All of the statutory powers of taxation and ability to make payments to impacted parties, assess the size and incidence of impacts, negotiate payments and to carry out general programs of economic development contained in IV above would be needed to allow a new entity to implement a compensation program. One advantage of such an approach would be to reduce the level of internal conflicts of interest inherent in the existing institutions. A disadvantage of creating a new entity would be the further splintering of water groups and lack of institutional knowledge.

VI. Three Prospective Texas Examples

Three examples of interbasin transfers of various sizes are reviewed here to provide an idea of how the compensation mechanisms identified would work out in particular cases. The examples use reasonable "ball park" estimates of the income value of water in different uses, as well as available alternatives to the transfer in order to determine the expected net income effect on the two regions involved in the transfer. The value of water estimates used in this study mean the income value of water, not the price of water one might expect to observe in today's market.

The income value of a commodity or resource is the standard way of measuring the appropriate economic value of such things within the discipline of economics if one is concerned with answering the question of how much of a monetary payment needs to be made to someone (some group) to make him (them) as well off as he (they) would otherwise be without (a portion of) the commodity or resource in question. The income value of water in various "uses" means not only the values associated with, for example, the irrigation of crops, but also the aesthetic and recreation values of water which get reflected in consumers' economic behavior. Even though the idea is to find a monetary payment that would leave people no worse off than they would be with the water in question, we do not claim that these income values necessarily incorporate all of the value of water; clearly, some values of water are beyond that which could ever be compensated for with monetary payments.

The aesthetic and recreation values of water get measured in the income value of water estimates even though the water is not "used" in the same way as it is for irrigation or drinking water, commonly known as "consumptive uses". The income value of boating recreation on a particular lake, for example, would be the amount of income one would need to pay a boater to find another lake for boating, or perhaps substitute another kind of recreation, leaving him as well off (satisfied) as he would be with access to the lake in question.

Each additional unit of water use one is deprived of may require more income to replace than the one before. In the boating example, for instance, more income would need to be paid for taking away the 5th of 10 outings per year than would be the case for the 10th outing, since it will likely be harder and harder (more expensive) to find alternatives for all of his boating pleasure.

The income value of water to a company that produces computer chips, for example, would be the amount of money one would need to pay the company to substitute the next best (lowest cost) alternative and leave the "bottom line" unchanged, probably the cost of internal recycling of more of the water the company uses than is now the case. As in the case of the boater, however, each successive unit of the company's current water use taken away may be worth more than the previous one to the company. If, for example, one wanted to know the income value of the last 50% of a company's water use, the 51st percentile unit may be worth considerable more than that of the 100th

percentile because the last units taken away will be more and more expensive to replace with recycled water.

The income value of water to the producer of water will also vary with the amount of water produced, as compared with the current market value of water. In a typical economic market, the cost of producing larger and larger units of water within a given time frame will rise. In a city water system the cost of providing water to residential units further and further out from the city center will rise because of higher pumping costs, among other things. As the State of Texas presses closer and closer to the physical limits of available water supplies, the cost of providing additional units will rise (higher pumping costs for groundwater, higher costs for impounding surface water at poorer and poorer reservoir sites, and rising costs of recycling). As these additional units of water costs rise, those having inexpensive sources who are able to sale water at current market prices will realize a rising income value of water as compared to producers who provide water from new sources. Therefore, to take away units of supply from an area will mean a rising loss of income on the producers' side as progressively larger units are taken away.

Another common means of measuring the value of water in economics is the price. But the price is a measure of the economic value of water determined "at the margin" in a particular use. A consumer only has to pay the going market price for all the units he buys, whereas the income value of each successive unit he is deprived of may be different than that of the previous one. Likewise a producer gets the same price for all units brought to market, even though the first units may cost less to produce than later units. That is, it is the interaction of the cost of producing the last unit brought to market, and the willingness to pay for the last unit taken off the market, that establishes the market price for a market commodity. Therefore, when measuring the income value rather than the price of water, it is the entire, relevant range of the demand and supply curves for a commodity that establishes the income value of water. Therefore, the market price of water is not the same thing as the income value of water. Appendix C contains a discussion of how the income values of water were calculated for this study.

The income value of water is broader than the consumer and producer values discussed above. Since producers (both those who produce water and those who use water) doing business at the current levels of production buy inputs from other local firms (backward linkages), and sell products to local firms (forward linkages) the local economy is interrelated. Therefore, if the production levels of water using and producing firms are decreased due to having less, or more expensive water, then other businesses in the region are impacted by a water export via an interbasin transfer. If production levels of backward and forward linked firms are impacted indirectly by the interbasin transfer, then incomes in those industries will be impacted. This indirect income impact can be measured by use of input-output models that capture and quantify the inter-industry trade relationships within the regional economy. These "multiplier" effects are used to estimate the over all income impact effect of an interbasin transfer. (See Appendix C).

Example 1: East Texas to Houston

Description. The Houston area municipalities will join in a cooperative agreement to develop or enhance an integrated system of pipelines, canals and reservoirs to supplement the area municipal water supplies with up to 600,000 acre-feet per year of Sabine River Basin water. The City of Houston will purchase surplus surface water under long term contract with SRA to be diverted out of Toledo Bend Reservoir and delivered to key points in the San Jacinto and Brazos River Basins, mainly into Lake Conroe, Lake Houston, Somerville Lake and Allens Creek. The certificate will designate M&I use.

There is a payment for the water of $0.05 per 1,000 gallons or $16.25 per acre-foot, a price justified by cost of service rules for SRA. The cost to Houston area users is estimated to be $607 per acre-foot of capacity for the cost of the conveyance system and pumps, plus a pumping cost of $0.033 per 1,000 gallons per foot of lift, plus the purchase price of the water.[30] Third-party compensation and sharing of net income gains would impose additional costs on Houston.

Impacted third parties in the Sabine are of two classes; fish and wildlife and related recreation and the overall economy because of the loss of the long term option to develop high valued uses for the water. While this prospect may be small, it exists none-the-less, making current holders of water rights reluctant to agree to out of basin transfers, especially at prices for the water dictated by the cost of service criteria for determining a reasonable price.

The past lack of interest in selling water to Houston under the current Texas statutes and the State constitution, is presumed to continue if no changes are made, the case against which an interbasin transfer should be compared. Increased incentives due to the payment of third-party impacts and net regional income sharing described in this report will encourage the transfer where interest was absent before. While there is no competing set of users currently seeking use of the 600,000 acre-feet within the Sabine River Basin, the option to develop high valued uses of the water in the future will be, in part, foregone by the granting of a certificate to Houston to transfer the water out of basin. SB 1 made interbasin transfer less likely in some cases because interbasin transfer water is given a junior water right status relative to earlier in time permits. Since the purchase envisioned here is for surplus water, the SB 1 restriction does not really apply in the

[30] Sources: The capital cost of transportation is based on data from a 1998 study of interbasin transfer options for the southeast area of Texas; Texas Water Development Board, et al, *Trans-Texas Water Program: Southeast Area, Technical Memoranda*, April 1998, p. 35. Pumping cost are based on data from a 1984 study of a planned water treatment plant for the City of Austin; Black and Vetch, et al, *Water Treatment Plant No. IV: A Report Prepared for the City of Austin Water and Waste Water Department*, 1985. The cost of service rate of $16.25 per acre foot is based on phone conversations with Mr. Albert Gray of the Sabine River Authority (March 8, 1999) and TNRCC staff member Mr. Terry Slade (December 21, 1998).

owner Sabine. Elimination of this provision will remove a barrier in some cases, but not in the Sabine.[31]

Approximate Size of the Impacts. Various annual impacts in the Sabine River Basin and in the Houston area are expected to occur as a result of a major interbasin transfer of Sabine River water to Houston area municipalities. Houston area municipalities, under Class A methods outlined here, would pay an annualized amount to support third-party payments to the Sabine River Basin for replacing valuable resources and/or regional income lost, plus 50% of the annual net regional income gain for the aggregate of the two regions.

The example, summarized in Table 1, is based on the sale of annual quantities rising to 600,000 acre-feet in year 2050 from Sabine River water. The impacts in both regions are based on progressively increasing annual transfers of water under the permit. Annual economic values and the associated fee structure are based on three future annual flow levels, 200,000 acre-feet in the year 2010, 400,000 in 2030 and 600,000 in 2050.

The value of fish and wildlife is indicated by the fishing and rafting value of streamflow. The fishing and rafting value is related to the level of streamflow. The estimate used in this example is $8.00 per acre-foot in the Sabine and $10.00 in the San Jacinto. The income benefits to the Houston area range form $1.4 million in 2010 to $4.2 million in 2050. The income foregone in the Sabine ranges from $1.1 million in 2010 to $3.4 million in 2050.

The other income value lost in the Sabine is the prospective development of the water for higher valued uses in the Sabine basin, such as industrial development that promotes economic growth. The estimated marginal value of water in industrial use is $282 per acre-foot, the average of values for seven major water using industries in the U.S., including chemicals, paper, minerals, sugar beet, cotton textile and meat packing enterprises. The marginal cost of supplying treated water to industry (inclusive of disposal costs) was assumed to rise from $150 per acre-foot at zero acre feet to $282 per acre-foot at 600,000 acre feet. The income value associated with this $282 water value estimate was calculated by subtracting from marginal revenue, the marginal cost of supplying the water, including the cost of distribution and treatment over the range of zero to 600,000 acre feet. The direct income value of industrial water use is, therefore $132 per acre-foot. The multiplier effect of income growth in the industrial sector is a factor of 1.91 times the direct value or $132 per acre-foot. Since it is very uncertain that future beneficial use will actually develop in the region, a 10% probability of such development occurring is assigned for purposes of this example, making the foregone income value in industrial use equal to $25.21 per acre foot.

The value of the transferred water in Houston is based on a weighted average of residential and industrial water values of $282 per acre-foot for industrial uses and $194

[31] The priority date could be important if the water already is permitted and if rights issued after the existing right would reduce the yield available for transfer.

for residential with a probability of occurrence of 100%. The income values associated with these water value estimates were estimated by subtracting from marginal revenue, the marginal cost of supplying the water, including the cost of distribution and treatment. Demand functions (marginal revenue) and marginal cost functions were approximated for each type of demand. (See Appendix C). The result is an estimate of $114 per acre-foot. The total value, after adding the multiplier effect is $114 X 2.312 = $263 per acre foot.

Estimated annual income losses in the Sabine range from $5.8 million per year in 2010 to $17.5 million in 2050. Annual income impacts in the Houston area range from $46.7 million in 2010 to $140.0 million in 2050. Transportation costs range from $24.9 million in 2010 to $46.4 million in 2050.

The project as structured would result in a net present value (NPV) of future net benefits to each region of $467.8 million, and a NPV of third-party payments (including income sharing) by Houston averaging $34.7 million per year or $713 million in present value (Table 1).

The results show that the net regional income will be positive at water transport levels of 75,000 acre-feet per year or more. The net regional income benefits would average $23.0 million per year for each region which has a net present value of $467.8 million. Summarized differently, Houston could afford to make an up-front payment to the Sabine folks of $713 million, invest $364.2 million in transport facilities, pay $16.25 per acre-foot for the water and still gain an average annual net income flow of $23.0 million with a net present value of $467.8 million.

Under Class B and C compensation the payments to the Sabine would be reduced to $11.7 million per year and the Houston area would retain all of the net income benefits above the cost of water, transportation costs and third-party impact costs amounting to $46.0 million per year or a NPV of $935.6 million. Table 2 summarizes the results of this case.

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Table 1. Third Party Impacts and Transfer Fee: East Texas to Houston

Impact/Item	Exporting Basin	Importing Basin	Transport Costs			Transfer Fee (3)		Annual Payment to Exporting Region
	Total Economic Impact	Total Economic Impact	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transport-ation	Excluding Transport-ation	
Sabine to Houston IBT	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 200,000 ac. ft./yr in 2010								
Total	($5,825,953)	$46,677,638	($24,907,863)	$15,943,822	$7,971,911			$13,797,864
Per Acre Foot	($29)	$233	($125)	$80		$194	$69	$69
b. Flow @ 400,000 ac. ft./yr in 2030								
Total	($11,651,906)	$93,355,277	($35,660,913)	$46,042,457	$23,021,229			$34,673,135
Per Acre Foot	($29)	$233	($89)	$115		$176	$87	$87
c. Flow @ 600,000 ac. ft./yr in 2050								
Total	($17,477,860)	$140,032,915	($46,413,963)	$76,141,093	$38,070,546			$55,548,406
Per Acre Foot	($29)	$233	($77)	$127		$170	$93	$93

	Net Income		Transfer Fee per Ac. Ft.		Payment to Exporting Basin
	To Exporting Region	To Importing Region	Including Transport-ation	Excluding Transport-ation	
Average Annual	23,021,229	23,021,229	176	87	34,673,135
Net Present Value	467,804,257	467,804,257			713,048,652

Table 2. Third Party Impacts and Transfer Fee: East Texas to Houston: No Income Sharing

Impact/Item	Exporting Basin: Total Economic Impact	Importing Basin: Total Economic Impact	Transport Costs: Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Transfer Fee (3): Including Transport-ation	Transfer Fee (3): Excluding Transport-ation	Annual Payment to Exporting Region
Sabine to Houston IBT	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 200,000 ac. ft./yr in 2010								
Total	($5,825,953)	$46,677,638	($24,907,863)	$15,943,822	$0			$5,825,953
Per Acre Foot	($29)	$233	($125)	$80		$154	$29	$29
b. Flow @ 400,000 ac. ft./yr in 2030								
Total	($11,651,906)	$93,355,277	($35,660,913)	$46,042,457	$0			$11,651,906
Per Acre Foot	($29)	$233	($89)	$115		$118	$29	$29
c. Flow @ 600,000 ac. ft./yr in 2050								
Total	($17,477,860)	$140,032,915	($46,413,963)	$76,141,093	$0			$17,477,860
Per Acre Foot	($29)	$233	($77)	$127		$106	$29	$29

	Net Income: To Exporting Region	Net Income: To Importing Region	Transfer Fee per Ac. Ft.: Including Transport-ation	Transfer Fee per Ac. Ft.: Excluding Transport-ation	Payment to Exporting Basin
Average Annual	0.00	46,042,457	118	29	11,651,906
Net Present Value	0.00	935,608,515			245,244,394

Example 2: LCRA to San Antonio.

Description. The City of San Antonio will purchase water rights from LCRA and divert up to 100,000 acre-feet per year from Lake Travis. Pipelines will be constructed to transport the water to Canyon Reservoir for storage and withdrawal as needed under an agreement with the Canyon Reservoir operator at a cost of $115 million or $1,157 per acre-foot of capacity. Pumping cost are $0.33 per 1,000 gallons per foot of lift. The other option will be to move the water through Canyon Lake and inject it into San Antonio's water system at key entry points near San Antonio thus directly backing out groundwater withdrawal from the Edwards. It is estimated that San Antonio will pay $105 per acre-foot of raw water (based on LCRA's current cost of service). San Antonio would also have to pay third-party impacts and 50% of net income shares, under Class A compensation.

The third-party impacts of the transfer will include income and property value loses for lake side property owners on Lake Travis, recreational opportunities principally on Lake Travis, fish and wildlife in areas downstream from Lake Austin, and potential municipal and industrial use in the Lower Colorado. Such impacts will occur because of lake levels and reduced downstream in-stream flows due to the loss of return flow, and its effect on reservoir management, and the foregone opportunity for future development. The probability of future M&I use for the water in the basin is assumed to be 20% in year 2010, 50% in 2030 and 100% in 2050[32].

Third-party impacts in the importing basin are negligible since fish and wildlife and related in-stream recreation uses in the San Antonio River below the City of San Antonio are unaffected. There are no increased flows from treated discharge since the net effect of the transfer is to substitute Colorado River surface water for Edwards groundwater. If there is a net regional income gain due to the transfer it will be shared among the two regions, but the estimates developed here show that net regional income will be negative.

Approximate Size of the Impacts. The results of this example show that the net regional income is negative in all years. While the positive income impacts to San Antonio exceed the negative income impacts in the Lower Colorado, transportation costs make the project infeasible (Table 3). The project as structured would result in a NPV of future net benefits to the aggregate of the two regions of $-135.6 million.

One component of the cost is lake side property value losses on Lake Travis. The estimates are derived from a special study of housing values as related to lake levels on Lake Travis. These values, and a probability of increased variability of lake levels due to the loss of return flows in the basin, are used to estimate the losses. The value is estimated to be $531 thousand in 2010 and $2.1 million in 2050.

[32] Assumes continued water use by rice farmers in the lower Colorado at current levels. At the time of the completion of this study, LCRA still had 75,000 acre feet of available water supplies not under firm contract.

The income value of water in industrial and municipal uses in this example are the same values used for the Toledo Bend to Houston example, with a probability of occurrence set at 100% in San Antonio for the full period, and rising from 20% in 2010 to 50% in 2030 and 100% in year 2050 in the Lower Colorado. That is, it is assumed that the water will have the estimated income value impacts with certainty throughout the 50 year period in San Antonio, a water short area, but will have a limited probability of having such income values in the Lower Colorado until the end of the period.

The results show that the net regional income will be negative in all years, and therefore the project should not be built. The average annual net income for the two regions is estimated to be a negative $7.1 million with a net present value of a negative $135.6 million. The project is not feasible primarily because of prospective, comparable valued development of the water for similar purposes in the basin, plus transportation costs and impacts on lake side property values.

Under Class B and C compensation the payments to the Colorado would average $7.9 million per year for third-party impacts and the San Antonio area would net a loss of $7.1 million per year or a NPV of $-135.6 million, relative to the cost of purchasing agricultural irrigation water in the San Antonio area (e.g., Medina County). Table 4 summarizes the results of this case.

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Table 3. Third Party Impacts and Transfer Fee: LCRA to San Antonio

Impact/Item	Exporting Basin: Total Economic Impact	Importing Basin: Total Economic Impact	Transport Costs: Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Transfer Fee (3): Including Transport-ation	Transfer Fee (3): Excluding Transport-ation	Annual Payment to Exporting Region
Sabine to Houston IBT	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 50,000 ac. ft./yr in 2010								
Total	($2,155,696)	$6,013,750	($6,285,974)	($2,427,920)	($1,213,960)			$941,736
Per Acre Foot	($43)	$120	($126)	($49)		$145	$19	$19
b. Flow @75,000 ac. ft./yr in 2030								
Total	($6,656,949)	$9,020,625	($7,179,800)	($4,816,124)	($2,408,062)			$4,248,887
Per Acre Foot	($89)	$120	($96)	($64)		$152	$57	$57
c. Flow @ 100,000 ac. ft./yr in 2050								
Total	($16,130,069)	$8,045,025	($8,073,626)	($16,158,670)	($8,079,335)			$8,050,733
Per Acre Foot	($161)	$80	($81)	($162)		$161	$81	$81

	Net Income: To Exporting Region	Net Income: To Importing Region	Transfer Fee per Ac. Ft.: Including Transport-ation	Transfer Fee per Ac. Ft.: Excluding Transport-ation	Payment to Exporting Basin
Average Annual	(3,554,655)	(3,554,655)	154	58	4,375,577
Net Present Value	-67,779,427	-67,779,427			85,718,733

Table 4. Third Party Impacts and Transfer Fee: LCRA to San Antonio: No Income Sharing

Impact/Item	Exporting Basin	Importing Basin	Transport Costs			Transfer Fee (3)		Annual Payment to Exporting Region
	Total Economic Impact	Total Economic Impact	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transport-ation	Excluding Transport-ation	
Sabine to Houston IBT	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 50,000 ac. ft./yr in 2010								
Total	($2,155,696)	$6,013,750	($6,285,974)	($2,427,920)	$0			$2,155,696
Per Acre Foot	($43)	$120	($126)	($49)		$169	$43	$43
b. Flow @75,000 ac. ft./yr in 2030								
Total	($6,656,949)	$9,020,625	($7,179,800)	($4,816,124)	$0			$6,656,949
Per Acre Foot	($89)	$120	($96)	($64)		$184	$89	$89
c. Flow @ 100,000 ac. ft./yr in 2050								
Total	($16,130,069)	$8,045,025	($8,073,626)	($16,158,670)	$0			$16,130,069
Per Acre Foot	($161)	$80	($81)	($162)		$242	$161	$161

	Net Income		Transfer Fee per Ac. Ft.		Payment to Exporting Basin
	To Exporting Region	To Importing Region	Including Transport-ation	Excluding Transport-ation	
Average Annual	0.00	(7,109,309)	201	106	7,930,232
Net Present Value	0.00	-135,558,854			153,498,159

Example 3: Lower Colorado to Corpus Christi.

Description. The transfer of an average of 35,000 acre-feet of interruptible water rights from the lower Colorado to the City of Corpus Christi will come from the purchase of existing irrigation district water in the Lower Colorado. The point of diversion would occur at the facilities currently used in the City's agreement with Garwood Irrigation Company and may amount to an average diversion of 35,000 acre-feet per year to be transported through the Lake-Texana-to-Corpus pipeline. The price of the water is assumed to be $36 per acre-foot, the estimated income value of the water to rice irrigation farmers in the Lower Colorado. It is assumed that LCRA's contracts for sale of interruptible water to rice farmers would be resold to Corpus Christi.

The primary impacted parties are those individuals and businesses forward and backward linked to the agricultural sector. The irrigation users will be paid for their water right, the value of which is assumed to be equal to the water income value to the irrigation farmers. Those not paid in the primary transaction are the third-party interests that have to be compensated.

The income value of water in industrial and municipal uses in Corpus Christi in this example are the same values used for the Toledo Bend to Houston example, with a probability of occurrence set at 100% for the full period. The impacts on incomes in agriculture in the Lower Colorado are estimated to be $36 per acre-foot, with 100% probability.

Third parties in the Corpus Christi area would be users of fish and wildlife and related recreation opportunities on Lake Corpus Christi, which is assumed to be negligible, and the total population due to the indirect effects of industry sector activity growth.

The results of this example are reported in Table 5 below. This project would create a positive net regional income gain and therefore benefits to both regions under Class A compensation. In addition to the fee or tax to pay for the basin of origin impacts, Corpus Christi will pay an estimated $36 per acre-foot for the water transferred. Including the transportation cost, third-party impact costs and $36 per acre-foot for the water, the total cost of water is estimated to be $179 per acre-foot or $0.49 per thousand gallons delivered into Lake Corpus Christi.

Approximate Size of the Impacts. The results of this example show that the project is feasible under the methods and procedures used here, resulting in net income benefits to both regions. The annual 35,000 acre-feet will make the existing pipeline operate at capacity thus making it efficient and helping make the project feasible. The transfer will

pay positive dividends to both regions. The net present value of future net benefits to each region is $17.1 million or an annual average of $785 thousand (Table 5).[33]

The value of the transferred water in Corpus Christi is based on a weighted average of residential and industrial water values of $282 per acre-foot for industrial uses and $194 for residential with a probability of occurrence of 100%. The income values associated with these water value estimates were estimated by subtracting from marginal revenue, the marginal cost of supplying the water, including the cost of distribution and treatment. Demand functions (marginal revenue) and marginal cost functions were approximated for each type of demand. The result is an estimate of $106 per acre-foot.

The results show that the net regional income will be positive throughout the period at transfer rates of at least 15,000 acre-feet per year. The average annual payment by Corpus Christi to the residents of the Lower Colorado basin is $2.5 million which has a net present value of $56.8 million. Summarized differently, Corpus Christi could afford to make an up-front payment to the Lower Colorado folks of $56.8 million, invest $40.5 million in transport facilities and still gain an average annual net income flow of $785,398 or a net present value of $17.1 million.

Under Class B and C compensation the payments to the Lower Colorado basin would be reduced to an average $1.8 million per year and the Corpus Christi area would retain all of the net income benefits above the cost of water, transportation costs and third-party impact costs, amounting to $1.6 million per year or a NPV of $34.3 million. Table 6 summarizes the results of this case.

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[33] There is some probability that interruptible water will be available in dry years, but it is assumed that impoundment in Lake Corpus Christi would allow local storage and that the contract agreement would allow exceeding 35,000 acre feet per year in wet years so that the average is not greater than 35,000.

Table 5. Third Party Impacts and Transfer Fee: Garwood to Corpus Christi

Impact/Item	Exporting Basin	Importing Basin	Transport Costs			Transfer Fee (3)		Annual Payment to Exporting Region
	Total Economic Impact	Total Economic Impact	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transport-ation	Excluding Transport-ation	
Garwood to Corpus Christi IBT	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 25,000 ac. ft./yr in 2010								
Total	($1,459,017)	$4,473,850	($1,968,239)	$1,046,595	$523,297			$1,982,314
Per Acre Foot	($58)	$179	($79)	$42		$158	$79	$79
b. Flow @30,000 ac. ft./yr in 2030								
Total	($1,750,820)	$5,368,620	($2,047,004)	$1,570,796	$785,398			$2,536,218
Per Acre Foot	($58)	$179	($68)	$52		$153	$85	$85
c. Flow @35,000 ac. ft./yr in 2050								
Total	($2,042,623)	$6,263,390	($2,125,769)	$2,094,997	$1,047,499			$3,090,122
Per Acre Foot	($58)	$179	($61)	$60		$149	$88	$88

	Net Income		Transfer Fee per Ac. Ft.		Payment to Exporting Basin
	To Exporting Region	To Importing Region	Including Transport-ation	Excluding Transport-ation	
Average Annual	785,398	785,398	153	85	2,536,218
Net Present Value	17,148,407	17,148,407			56,759,176

Table 6. Third Party Impacts and Transfer Fee: Garwood to Corpus Christi: No Income Sharing

	Exporting Basin	Importing Basin	Transport Costs			Transfer Fee (3)		
Impact/Item	Total Economic Impact	Total Economic Impact	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transport-ation	Excluding Transport-ation	Annual Payment to Exporting Region
Garwood to Corpus Christi IBT	(dollars)	(dollars)	(dollars)	(dollars)	(dollars)	$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 25,000 ac. ft./yr in 2010								
Total	($1,459,017)	$4,473,850	($1,968,239)	$1,046,595	$0			$1,459,017
Per Acre Foot	($58)	$179	($79)	$42		$137	$58	$58
b. Flow @30,000 ac. ft./yr in 2030								
Total	($1,750,820)	$5,368,620	($2,047,004)	$1,570,796	$0			$1,750,820
Per Acre Foot	($58)	$179	($68)	$52		$127	$58	$58
c. Flow @35,000 ac. ft./yr in 2050								
Total	($2,042,623)	$6,263,390	($2,125,769)	$2,094,997	$0			$2,042,623
Per Acre Foot	($58)	$179	($61)	$60		$119	$58	$58

	Net Income		Transfer Fee per Ac. Ft.		Payment to Exporting Basin
	To Exporting Region	To Importing Region	Including Transport-ation	Excluding Transport-ation	
Average Annual	0.00	1,570,796	127	58	1,750,820
Net Present Value	0.00	34,296,814			39,610,769

Alternatives for Distributing the Fee or Tax to Impacted Parties

Different mechanisms will be required to most closely match the third-party impacts with payments. Efficiency criteria argue for the matching of income equivalent payments to compensate for income losses, rather than the subsidy of prices or other indirect methods. Practical and/or legal considerations may not make the implementation of this rule possible or advisable. The following is a brief discussion of the most likely means of payment, assuming statutory authority is given to allow them.

Sabine to Houston

Class A Compensation

(1) Fish and wildlife--funds would be transferred from the fee/tax collecting agency to state, federal and local agencies concerned with fish and wildlife management. Appropriate alternatives to lost fish and wildlife would be developed and funded with a portion of the annual fee payment. TWDB, SRA or other regional/state agency could finance such projects by issuing bonds based on the expected income flow from Houston.[34]

(2) Economic development programs could be funded with an average annual income flow of $28.8 million per year ($34.6-$5.8), or through up-front grants of $670 million (total payments minus fish and wildlife payments). It is likely that the program would be made up of both grants and annual payments for projects managed by a) SRA, b) Texas Water Development Board or c) a combination of state, regional and city economic development agencies.

Class B Compensation

The approach under Class B Compensation would be the same as in Class A except less money would be available for funding economic development programs.

Class C Compensation

The approach under Class C Compensation would most likely be to pay for SRA project priorities and fish and wildlife benefits through the Texas Parks and Wildlife Department, but with no income sharing to pay for economic development. All of the funding except fish and wildlife replacement would go toward water related projects in the basin, whether or not they were needed.

LCRA to San Antonio

[34] The Texas Fish and Wildlife Department is required under state law to restrict a proposed diversion by imposing minimum streamflow requirements to protect fish and wildlife. Such requirements in practice are designed to prevent such losses to the maximum extent possible, but if some impacts occur to require mitigation. Implementation of the law does not mean that absolutely no impacts on fish and wildlife will occur.

Class A Compensation

(1) The project should not be developed since net regional income would decline. A thorough analysis might yield different results, however, and if so, the alternatives for payment of various parties are as follows.

(2) Fish and wildlife--funds would be transferred from the fee/tax collecting agency to state, federal and local agencies concerned with fish and wildlife management. Appropriate alternatives to lost fish and wildlife would be developed and funded with a portion of the annual fee payment. TWDB, LCRA or other regional/state agency could finance such projects by issuing bonds (would require legislation) based on the expected income flow from San Antonio.

(3) Annual payments to qualifying lake side property owners could be funded out of a contingency fund, to be paid only if property values are demonstrated to have declined at the time of sale. The program could be operated by a) LCRA, b) Texas Water Development Board or c) a new entity created for the purpose.

(4) The transfer of net regional income in addition to the payments in (2) and (3) would be administered through economic development and water conservation programs such as that already in place at LCRA.

Class B Compensation

The approach under Class B Compensation would be the same as in Class A except less money would be available for funding economic development programs.

Class C Compensation

The approach under Class C Compensation would most likely be to pay for LCRA project priorities and fish and wildlife benefits through the Texas Parks and Wildlife Department, but with less funding and no income sharing to pay for economic development or direct payments to lake side property owners. All of the funding except fish and wildlife replacement would go toward water related projects in the basin, whether or not they were needed.

Lower Colorado to Corpus

Class A Compensation

(1) Payments to agribusinesses related to rice farming could be made by setting up an administrative process for annual payments through the Texas Department of Agriculture or a Federal agency. Payments to agribusinesses would mostly be made in the form of grants and loans for alternative enterprise development.

(2) Fish and wildlife development projects would be funded by annual transfers of the fee paid by Corpus to state and federal fish and wildlife agencies for appropriate projects to account for the expected fish and wildlife losses due to the transfer of water.

(3) The transfer of net regional income in addition to the payments in (2) and (3) would be administered through an economic development program such as that already in place at LCRA, targeted to the rice farming area of the Lower Colorado.

Class B Compensation

The approach under Class B Compensation would be the same as in Class A except less money would be available for funding economic development programs.

Class C Compensation

The approach under Class C Compensation would most likely be to pay for LCRA project priorities and fish and wildlife benefits through the Texas Parks and Wildlife Department in the Lower Colorado rice farming area, but with less funding and no income sharing to pay for economic development. All of the funding except fish and wildlife replacement would go toward water related projects and water conservation in the basin, whether or not they were needed.

VII. Impediments to Various Mechanisms

The primary impeding factor to implementing a compensation mechanism is gaining political acceptance for changing the historical notion of preference for water availability in the basin of origin, to that of a guarantee that water will not be permanently committed to out-of-basin use without full compensation. That is, the new policy is to protect the area or basin of origin by providing off-setting values or compensation. Once the principle is accepted, implementation could always be achieved by specific legislation designed to provide compensation in individual cases. Such an approach, however, is not likely to produce economically efficient compensation. The specific approaches investigated in this study are intended to help develop efficient and equitable mechanisms that do not require special legislation for every interbasin transfer in order to protect the interests of the basin of origin.

One difficulty of implementing a compensation program is getting agreement among the interested parties on the size of the compensation payment. There are widely varying beliefs concerning the regional income that can be generated by having water supplies available. The proposed approach in this report is to assign a responsible entity the task of estimating the income contribution of the water to be transferred in the two basins, and to negotiate the associated value among the parties. Having reached an agreement, the compensation plan would be included in the applicant's application for a change of the water right permit at the TNRCC.

The primary impeding factors under current law are those discussed in the previous sections, namely the limitations of governments on direct payments to individual private parties, and restrictions on the use of taxes and fees to fund such payments, at least in a way that guarantees economic efficiency and equity. There are a number of alternative means of avoiding the constitutional problems that are possible, building off of the fairly recent changes in the constitution and through correctly designed legislation regarding the operation of economic development and energy conservation programs.

The limited cases of third-party payments in water transfer cases we have reviewed are helpful, but none constitute a system of direct and indirect payments so as to provide a clear "road map" to follow. A Nevada case involved a direct payment (cash) to an Indian nation to compensate for the loss of water related benefits due to an intrabasin transfer. The payment, of $40 million was made from the Federal government to fund an economic development program.[35] Another $43 million payment was made to fund the purchase of land and water rights to consolidate tribal holdings within the reservation. Another case is a well known Colorado interbasin transfer statute that has the practical effect of requiring the importing region to build water storage facilities in the basin of origin (an in-kind payment) to compensate for the value lost in the exporting basin.[36]

[35] Public Law 101-618 (PL 101-618), Title I-The Fallon Palute-Shoshone Indian Tribal Settlement Act.
[36] Colorado River Basin Project Act, P.L. 90-537,§ 203(a), 43 U.S.C. ,§ 1513(a) (1982).

The most troublesome part of the third-party compensation problem is that of direct payments to property owners for decreased property values due to the transfer. The three examples illustrate the potential importance of this problem. The best example we have found for addressing this problem by a state government is the Illinois low-level waste facility agreement between the State of Illinois and a small Illinois town to guarantee private party property values at the time of sale, and the New York statute that allows those with property value impacts to collect damages.

Attempts to directly subsidize low-income, old-aged Texans (a direct payment) for high energy costs during the late 1970's was found to be unconstitutional by the Attorney General. Examples of programs that do make direct payments or subsidies to individuals for property items and/or monthly expenses is that of the energy conservation programs of the City of Austin and San Antonio. These programs appear to avoid the public agency-to-private-party payment problem through adherence to the "Willatt Criteria".[37] These programs, however, have not yet survived a constitutional test in the courts.

The test used by the courts in deciding the constitutionality of Texas government payments to individual private sector parties are those referred to as the "Willatt Criteria". The four criteria amount to a four part test:

1) is accomplishment of a public purpose the predominant purpose of the transaction
2) is there assurance that a public purpose will be accomplished
3) is there sufficient protection of the handling of the public money
4) is there "consideration" passing to the political subdivision.

Special legislation that respects these four tests will go a long way toward assuring that the most troublesome parts of third-party compensation, that of property value losses, could be addressed. The Illinois low-level waste case is the clearest example we have found where this was accomplished.

Direct income payments, or payments to defer costs, will likely be equally troublesome. Although direct payments to private parties are commonplace in Federal programs they are not in the states except in the welfare programs area where state money matches Federal money. These programs operate off of statutory authority to allow the state to receive the Federal money under matching rules, and depend on specific recipient qualifications.

[37] Willatt, Mike, "Constitutional Restrictions on Use of Public Money and Public Credit", Texas Bar Journal, May, 1975.

VIII. SUMMARY

Historically the water laws in the Western U.S. have protected the basin of origin from unreasonable transfers of its surface water supplies out of basin by reserving **water** for the area's ultimate requirements or providing for recapture in the event of future need. Texas has a system of basin of origin protections, although it has never "reserved" water for use in the basin of origin. Texas Supreme Court ruling in 1966 in City of San Antonio v. Texas Water Commission held that the Texas law prohibits interbasin transfers if the transfer would "prejudice any person or property" within the basin of origin; prejudice is to be determined by weighing the detriments to the basin of origin against the benefits of the diversion. Senate Bill 1 contains a "junior" water rights provision that makes the right to transfer water junior in priority to water rights granted before the time of the application for transfer. While there is a well founded and long history of such practices throughout the Western states, the current conditions in Texas suggest that transfers be encouraged, rather than discouraged, through a program of compensation. This study identifies alternative third-party compensation mechanisms and revenue sources and illustrates how they might be applied in three important Texas examples. The compensation approach achieves the following important results.

- Protection for the area or basin of origin will be preserved by requiring compensation to the basin of origin that is at least as valuable as the transferred water when third-party interests are included.
- Primary parties are compensated by the purchase price of the water or water right (if any), assuming the water is sold in a fair trade at arms length.
- The third parties to be compensated are those in-basin residents and businesses that do, or will, benefit from the water to be transferred but do not have established rights to the water.
- Primary and third parties in the basin of origin will often be net gainers from an interbasin transfer under the procedures outlined here because net income benefits in the receiving basin will be shared with the basin of origin.
- Basin of origin protection through compensation described in this report will encourage transfers that will often result in net economic gains for both the exporting and importing basins, as well as the Texas economy at large.

A number of mechanisms are available and institutions already exist for carrying out third-party compensation programs, but authority does not exit for imposing a fee or tax to fund such payments. (Such authority does exist for selected ground-water districts, however). The current authority to pay for any number of water development and conservation projects currently resides with river authorities and with the Texas Water Development Board and could be marshaled to accomplish a form of compensation. Some river authorities have the authority to operate economic development programs that could be the mechanism for delivering economic development opportunities through grants, loans and the like to compensate for general economic development opportunities lost due to the transfer of water out of basin. Employment training programs are also

means of providing general economic growth opportunities for lost opportunity due to water transfers out of basin. The same kind of authority to operate economic development programs now peculiar to the river basins with electric sales would need to be extended to other river basins.

The kinds of payment that can be made under existing authority, however, are limited to water related activities that may not allow matching of benefits through compensation with income foregone at all. New and different legislative authority will be needed to compensate businesses and individuals for clearly identifiable negative impacts of lost water due to transfer. Since the assessment of the income foregone associated with a given transfer is a highly uncertain matter, one option for arriving at a reasonable number is to assign the responsibility of estimating such values to a responsible agent, such as the Texas Water Development Board, then set up a negotiating procedure to arrive at a reasonable number agreeable to the parties. Upon agreement, the negotiated compensation would be approved by the TNRCC in the hearing for approving the transfer. Table 7 summarizes the current authority, needed new authority for new approaches involved in Class A and B mechanisms, and a summary of the obvious institutional organizations to carry out the various options.

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Table 7. Alternative Mechanisms for Payment of Third Party Impacts

	Mechanism	Direct or Indirect	Income Equivalent	Class A	Class B	Class C
1	Direct income payments (farmers and agribusinesses)	Direct	Yes	X	X	
2	Property value guarantees	Direct	Yes	X	X	
3	Subsidies of water bills	Direct	No			X
4	Cost sharing or payment for water substitutes or capital equipment	Direct	No			X
5	Payment for water conservation devices / programs	Indirect	No			X
6	Fish & wildlife replacement	Direct	Yes	X	X	X
7	Intergovernment transfer for tax revenue losses	Direct	Yes	X	X	
8	Community economic development program	Indirect	Yes	X		
9	Employment training programs	Indirect	Yes	X		
10	Technology development	Indirect	Yes	X	X	X

Alernative Responsible Agency and Needed Legislative Authority

		Function/Legislation Needed		Administer Compensation Payments		
	Alternative Responsible Agency	Assess Fee (Taxing Authority)	Evaluate and Negotiate Compensation	Class A	Class B	Class C
1	TWDB as Broker via Water Bank (TWDB)	TWDB(EL)	TWDB(AA)	TWDB(EL)	TWDB(EL)	TWDB(AA)
2	TWDB as Broker/Trader via Water Bank (TWDB)	TWDB(EL)	TWDB(AA)	TWDB(EL)	TWDB(EL)	TWDB(AA)
3	River Authorities as Broker (RA)					
	a. all functions	RA(EL)	RA	RA(EL)	RA(EL)	RA
	b. split functions	TWDB(EL)	TWDB(AA)	RA(EL)	RA(EL)	RA
4	Regional Planning Groups (RPG)					
	a. all functions	RPG(EL)	RPG(EL/AA)	RPG(EL/AA)	RPG(EL/AA)	RPG(EL/AA)
	b. split functions	TWDB(EL)	TWDB(AA)	RPG(EL/AA)	RPG(EL/AA)	RPG(EL/AA)
5	New Agency (NA)	NA(EL)	NA(EL/AA)	NA(EL/AA)	NA(EL/AA)	NA(EL/AA)

Notes: EL=Enabling Legislation needed; AA= Appropriation Authority needed

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Definitions

1. **acre-foot** - an area of 43,560 square feet by one foot thick, a volume that will hold 325,850 gallons of water.

2. **backward and forward linkages** - economic transactions among industry types thought of as a chain of transactions from one industry to another until a basic product becomes a final product for consumers. Such chains of exchanges are referred to as either selling "forward" to industries which buy the products as input to their own production process (forward linkages), or buying "backward" from industries that sell their products as inputs to the current industry's production process (backward linkages).

3. **compensation mechanism** - the process, actions or steps that will achieve compensation of third parties for economic losses due to transfer of surface or groundwater from one basin to another. A mechanism may be a set of rules adopted by an existing agency of a state or local government, or an institution set up by the state legislature to carry out the functions of receipt of revenues and payment of compensation required as the result of approval of the transfer. In the case where the primary transaction is strictly among private parties, the mechanism may be a set of regulatory rules for how the private entities must behave in order to maintain the right to transfer water.

4. **firm water** - a supply of stored water that is taken from the combined firm yield of a reservoir system.

5. **foregone income** - the value of the income opportunity given up by accepting the chosen opportunity; often referred to by economists as "opportunity cost". The idea is that every economic choice or decision involves giving up or "foregoing" some other choice. The value of the next best choice is the cost of choosing the best option. Since economic resources, such as water, are scarce, to make use of it for one purpose is to forego another. We have to know the value of what is foregone before we know that the selected option is the best, and the foregone value can be paid for by the value of the selected option or else the decision is not economically rational.

6. **interruptible water supplies** - stored water pursuant to a contract where the provisions of the contact provide that release downstream is subject to interruption or curtailment.

7. **marginal cost** - the change in total cost resulting from a unit change in output of the firm.

8. **marginal revenue** - the change in total revenue resulting from a unit change in output of the firm.

9. **water right** - a legal right granted by law, to take possession of, and divert water from a water supply for a beneficial use.

10. **run-of-river flows** - the natural flow in the river that is available under law to honor a water right with a given priority date at a particular point on the river at a point in time.

11. **streamflow** - rate of flow of water that occurs in a natural channel.

12. **third party** - any individual, business, or government in the basin of origin or the receiving basin that is economically affected by the transfer, but is not one of the two direct parties to the transfer.

13. **Willatt Criteria** - the test used by the courts in deciding the constitutionality of Texas government payments to individual private sector parties; the four criteria amount to a four part test:
1) is accomplishment of a public purpose the predominant purpose of the transaction
2) is there assurance that a public purpose will be accomplished
3) is there sufficient protection of the handling of the public money
4) is there "consideration" passing to the political subdivision.

APPENDIXES

Appendix A
Summary of Limitations of Taxes and Fees

Severance Tax

Severance taxes were first used in Medieval England to tax crops as the commodities were "severed" from the earth. In modern times in the U.S. the severance tax has been applied (uniquely) by the several states of the union primarily to mining industry products. The state of Michigan was the first to enact a severance tax (in 1846) and it applied to natural resources. Texas was the first state to enact a crude oil severance tax (in 1905)[1].

As the use of the severance tax became more prevalent in the U.S. it was applied to a broader set of commodities. Today the severance tax is applied to:

- oil and gas (including condensate liquids);
- coal and lignite;
- uranium;
- sulfur;
- cement;
- several other minor minerals;
- fish; and
- timber.

Downstream products and activities are sometimes taxed, such as refined petroleum products and pipelining in New Mexico (refined products tax now repealed). While severance taxes are primarily levied on non-renewable energy and mineral products, they are also applied to non-mineral, renewable resources of fish and timber[2].

The forms, names and purposes of severance taxes collected in the U.S. differ somewhat among the states and among the types of commodities taxed. The following sections deal with each of these topics.

Types and Formulations of Severance Taxes

The forms, or formulas for severance taxes are of two basic types. One common formula is as a percentage of value, usually market value. This simple form is sometimes varied by factors that relate to the costs of production, such as the Montana severance tax on coal that varies with the depth of the mine [2]. In some instances the typical severance tax based on percentage of value is modified to add a percentage of net profits. An example of this would be the precious medals severance tax in South Dakota. The Texas severance tax on crude oil establishes a lower, incentive rate (2.3% of market value) for oil produced from qualified new or expanded enhanced recovery projects.

The establishment of market value is itself a contested matter at times. A current lawsuit in Texas challenges the use of "posted" prices that have been used for decades by oil companies in the industry. The suit seeks to establish spot prices as the relevant market price reference (with transportation and quality adjustments) now published daily with the crude oil futures market. Other difficulties arise in valuing petroleum products used in other processes within a company and not traded in the open market.

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[1] Hamilton, Billy C., ed., Rethinking Texas Taxes: Final Report of the Select Committee on Tax Equity: Volume 2: Analysis of the Tax System. Austin, February 1989. p.260.

[2] Commerce Clearing House. State Tax Guide, July 1997.

The second method of severance tax calculation is a dollar and cent rate per unit of production (barrel of oil, 1,000 cubic feet of natural gas or ton of coal) where the rate is set by statute. In addition to a variety of exemptions and exclusions, some states adjust the dollar and cent rate for inflation, or changes in the market price of the taxed commodity[3].

The class of tax generally referred to as severance tax is not always called severance tax, although the practical way of imposing it is essentially the same because the selection of the base. The names of such taxes include (1) severance, (2) occupation, (3) conservation, (4) reclamation, (5) extraction, (6) production, (7) privilege and (8) assessment. The Texas severance tax is, for example, properly named an occupation tax because the law makers at the time of adoption in 1905 were concerned that a tax called "severance tax" might be found to be unconstitutional. The state constitution had commonly been interpreted as limiting the taxing power of the state to those taxes specifically named (income, property, poll and occupation taxes). The State of New Mexico tax on the severance of oil and gas is legally a privilege tax based on the value of oil removed from the natural gas stream at or near the wellhead and the taxable value of gas (3.15% for oil and 4% for gas).

Rationale and Purposes Served

One rationale for the taxation of minerals via the severance tax is that these resources are natural endowments in trust and will one day be depleted. Therefore, the state, on behalf of the citizens, is justified in taxing the flow of value as it is produced in order that the public trust will be preserved. Another rationale is that the state and communities where resources are produced incur a unique social, environmental and governmental cost associated with the activity. Therefore, the state is justified in taxing the removal of the resource to offset these costs. Given the general need for tax revenues to support the government, the states also tend to over tax their major natural resource. A large portion is often exported to other states, thus out-of-state consumers are thought (sometimes in error) to share the tax burden. There was no particular rational for government taxation of crops in early England, save the general need for funds to support the whims of the Crown and the fact that agricultural products, land and foreign trade through the ports were the primary economic values available to be taxed in that accent economy.

An example of taxation justified to a considerable degree on the social and environmental costs is the additional state severance taxes placed on coal production in the 1970s (especially Montana and Wyoming). Although the evidence did not support the cost-based rationale[4], Montana argued that the oil crisis and national energy policy were to blame. Such policy emphasizing a switch from oil and gas to coal for electric power and industrial purposes placed an unusual burden on communities near the mines. These burdens were borne mostly by communities in a few states because national environmental policy placed a premium on low sulfur coal, available only from strip mines in the West. Although state and federal law required the restoration of the surface area disturbed by strip mining to near natural condition, such restoration took years to accomplish. In the mean time aesthetic qualities of the area suffered. Large work forces often converged upon small communities who were ill equipped to accommodate the rapid growth in public service requirements, such as schools and police and fire protection. National Economic Research Associates, Inc. in rebuttal of the cost argument, estimated that the full economic, environmental and social costs of the extra production amounted to no more than one and one-half percent of the value, a small fraction of the 30% rate imposed.

One interesting aspect of the set of taxed commodities in the U.S. is the distinction between renewable and nonrenewable resources. The hard minerals, coal, uranium, oil and gas are exhaustible resources. The states having significant endowments of these resources face a loss of future economic activity when the resource is economically depleted. Therefore, a rationale for taxation is to create an

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[3] Ibid., Louisiana

[4] Hearings Before the Subcommittee on Governmental Affairs, United States Senate: Ninety-Seventh Congress, First Session, ***The Commerce Clause and the Severance Tax***. July 15 and 16, 1981.

investment in an alternative income stream that will be ongoing. For example, Texas dedicates a major portion of its oil and gas taxes to public education, therefore investing in a renewable, human resource. New Mexico imposes a privilege tax on the severance of oil and gas (3.15% and 4% of market value, respectively, for oil and gas) as an Emergency School Tax. The severance tax on oil and gas in Montana is shared among state government, school districts and county governments[5].

The other states who tax renewable resources of timber and fisheries, however, cannot rationalize the tax on the exhaustion principle. Severance taxes on these renewable resources are often dedicated to maintenance of the resource. Timber and fishery husbandry continue to replenish the stocks of these resources on an ongoing basis, but this husbandry is costly and often carried out by the state. Oregon, for example, taxes the severance of timber differently in arid Eastern and moist Western Oregon and places the funds in separate reserve accounts for replenishing the stocks of timber separately in the two regions. Washington taxes sports fishing and commercial fishing activities in order to fund the cost of maintaining propagation facilities[6].

Severance taxes are usually applied at the point of "severance" or production. Even if the tax is an occupation tax, it is applied to the occupation of producing, or the privilege of producing (oil, gas, coal, etc.). In the area of extractive resources, the production point where taxes are applied is typically at or near the well-head or mine mouth. In some cases a set of severance, privilege, ad valorem and excise taxes is applied to the stream of products from the well-head through the downstream refining process[7]. In this case the full set of taxes is more or less related to the extraction of a non-renewable resource, crude oil. States having energy, timber and fishery resources apply a wide variety of taxes to the stream of products that flow from the resource.

Obligations of the Parties

The two entities involved in state severance taxes include the taxed business and the state government. The obligation of the taxed business is to pay the taxes due by the due date, and to provide such documents of verification as required by law. In most instances' adjustments and amendments to prior filings can be provided as allowed by the adopted tax code. The due dates range from monthly to annually as required by a statute or collecting agency rule.

The obligations of the state government include the proper interpretations of statutory language and intent on the part of the collecting agency, the adherence to state and federal law in the passage of state laws, and in their subsequent implementation. The states typically adopt policy guidelines for what constitutes a "good" tax system.

Texas, for example, has stated criteria for evaluating the Texas state and local tax system. The criteria are as follows[8]:

Adequacy: The tax system should produce the necessary revenue in the most efficient manner possible.

Equity: The state and local tax burden should be distributed fairly. Two approaches to fairness are concepts of benefits received or ability to pay. The benefits principle implies that taxpayers who benefit from a government service bear its cost. In cases where the benefits principle does not apply, the ability to pay principle means that taxpayers pay according to their resources.

[5] Internet at http://www.nfoweb.com/folio.pgi/MTCODE/doc.

[6] Ibid.

[7] Op.Site, New Mexico

[8] Hamilton, Billy C., ed., Rethinking Texas Taxes: Final Report of the Select Committee on Tax Equity: Volume 2: Analysis of the Tax System. Austin, February 1989..

Efficiency: The tax system should not unnecessarily or unintentionally interfere with private economic decisions.

Economic Competitiveness: To the extent possible, the tax system should be designed to enhance state and local economic development or at least should not retard development.

Stability: The tax system should be constructed to avoid unpredictable shifts due to changing economic conditions or other factors. The system should promote certainty on the part of taxpayers and government.

Simplicity: The tax laws should be as simple as possible, to minimize compliance costs for taxpayers and enforcement costs for government tax administrators.

Balance: To the degree possible, government should avoid over-reliance on any one tax or set of taxes. The tax system should be balanced among a number of taxes.

Broad Base: Individual taxes should be broadly based, minimizing tax preferences, to provide even-handed treatment of all taxpayers and to keep tax rates as low as possible.

Intergovernmental Linkages: Tax decisions should recognize the connections between state and local tax systems.

Such criteria are applied to some degree in the creation of new tax laws and in their implementation, but largely represent an ideal state of affairs. The piece-meal fashion in which tax policy is made, joined with the politics of vested interest make such policy guidelines difficult, if not impossible to follow.

The various states are responsible for using the taxes collected for purposes dictated by statute or the constitution. In Texas, for example, a significant portion of the severance tax is dedicated to the support of public schools. Twenty-five percent of the tax, after subtracting one-half of one percent for administrative costs, is constitutionally dedicated to the Foundation School Fund for public education. The tax on timber is dedicated to the maintenance of forests in Oregon. A license fee on fishing is dedicated to the operation of hatcheries and related expenses for maintenance of the fish population in rivers and streams in Washington. Montana's severance tax is distributed to the state, counties, and school districts by formula.

Another, and perhaps more imposing set of obligations of state governments is defined by U.S. statutory and Constitutional limitations and prohibitions. One important restriction on state taxation has, in fact, come about as a consequence of severance tax policy. The Commerce Clause of the U.S. Constitution prevents the states from adopting taxes that impinge, in a discriminatory way on interstate commerce. Early Supreme Court cases on the matter make it clear that states can not directly tax interstate commerce. Later cases establish that interstate commerce should "bear its fair share of the state tax burden."

A 1977 Supreme Court case[9] set the standards based on multiple taxation concerns. These standards amount to a four-part test that was clearly defined in the Complete Auto Transit case of 1977. This four part test is a check on whether state taxes are an unconstitutional restriction on interstate commerce. The four are as follows:

(1) the tax is applied to an activity with a substantial nexus with the taxing state;
(2) is fairly apportioned;
(3) does not discriminate against interstate commerce; and
(4) is fairly related to the services provided by the state.

[9] Complete Auto Transit v. Brady, 430 U.S. 274 (1977).

The Montana coal tax of 1975, though not ruled unconstitutional by the Supreme Court, was weakest on the fourth test. The majority opined that the tax met the fourth test since its measure was reasonably related to the contact the taxpayer has with the state. Since the Montana severance tax was based upon activity which occurred entirely within the state and was measured as a percentage of the value of the coal extracted, the Court concluded that the tax was in "proper proportion" to the taxpayers' consequent enjoyment of the opportunities and protections which the state afforded. The Court refused to accept the argument that the fourth test required a factual inquiry into the costs and benefits of state services provided to the taxpayer. The Court concluded the appropriate level of the tax was a legislative matter. The minority opinion of the Court dissented on the grounds of the fourth test, finding that a 30% tax impinged on interstate commerce.

The Court, rather than throwing out the Montana tax, opined that the Congress could, and perhaps should, remedy the problem by limiting state severance taxes. Two Congressional hearings followed that threatened to place a 15% limit on State severance taxes.

Fees

The following summary concerning fee is made up of selected parts of the text in the Comptroller's 1989 review of the Texas tax system, as reported to the Select Committee on Tax Equity. [10]

> "Economist Edwin Seligman developed a framework for considering government revenue over 95 years ago that helps in distinguishing fees and taxes. According to Seligman, a revenue source may be considered 'in terms of degree of volunteerism or compulsion under authority of police powers, tax powers or powers of eminent domain; and in accord with the economic relation of the individual to his government or more particularly the degree of individual benefit and the degree of public purpose. Within this classification system, taxes and user fees lie at opposite ends of the spectrum.
>
> Because of the element of volunteerism, user fees have many of the same characteristics as prices in the private market; the public goods which are distributed through user fees take on many of the characteristics of private goods. Through prices, consumers essentially cast a vote regarding the desired quantity and quality of a particular service or commodity. Government is, in effect, selling specific services to the consumers. By applying this concept to the public sector, policy makers can receive and interpret valuable information regarding the level of services desired by the public.
>
> Economists say that public pricing can actually encourage more efficient use of public resources because consumers will take more responsibility for the amount or quality of a service they use when a real cost is involved. Public officials will also be encouraged to take more responsibility in rationing scarce public resources when there are clear signals of demand from citizens. There is greater accountability for both government and the public where public prices are involved, proponents argue.
>
> Because of the large number and wide variety of user fees, there is also a wide variety of definitions depending on the scope of the discussion. The narrowest definition of user charges includes the many fees charged by government that can be viewed as voluntary (swimming pool and park entrance fees, trash collection, parking fees and bus fares). This group of fees is also referred to as 'charges,' "current charges' and 'charges for services.'
>
> Another category of user charges--licenses--is generally included in a discussion of fees. License taxes are defined as a fee levied by a government as a condition for exercise of a business or non-business privilege. Examples include occupational license for professionals such as engineers and barbers, driver's licenses and radio operator

[10] Billy C. Hamilton, *Rethinking Texas Taxes: Final Report of the Select Committee on Tax Equity: Vol. 2, Analysis of the Tax System,* Feb. 1989, pp. 4242-428.

licenses.

Beyond this narrow definition, there is considerable debate about what additional sources of revenue should be included when a more comprehensive analysis of user charges is undertaken. Some studies include income from public utilities, motor fuels taxes and state-operated liquor store income--revenues from specific activities dedicated for related purposes. Though generally not classified as user charges these non-tax revenues nevertheless reflect many of the same characteristics.

At the local level, special assessments--another kind of user-base fee--are becoming increasingly significant in funding infrastructure improvements. Special assessments are compulsory levies upon real property for specific benefits as a result of public investments or services.

For example, a developer may be charged for such things as sidewalks, roads, curbs and water and sewer lines in the development that have traditionally been funded through general tax revenue. Although special assessments are not voluntary, they do direct payment toward the specific group benefiting from the public expenditure.

This chapter is restricted to the two primary types of fees: charges and license taxes.

Principles and Guidelines

Not all government services are good candidates for financing through user fees. As a general rule, the more closely a public service resembles a private good, the more easily user fees may be employed as a method of finance. To charge a fee, two conditions must exist: direct benefits must be easily identified, and it must be possible to *exclude* nonusers from the benefits of the service.

The kinds of services at the local level most amenable to this method of finance include transportation, health and hospitals, some aspects of education, parks and recreation, housing and urban development, public works and general government.

At the state level, areas that are likely to lend themselves well to user fees include: education, transportation and highways, public safety, parks and recreation, public health, natural resources and regulatory and administrative functions.

Because of the large number and wide array of user fees, it is helpful to organize them into types. Alice John Vandermeulen, of the University of California, has been a special consultant to the California Legislature on fees and licenses. She developed a fee classification system in 1964 that is still useful today. The five categories are:

(1) levies on particular kinds of economic activity;
(2) fees for making clerical entries, copying and printing;
(3) payments for specific services rendered to specific individuals;
(4) fees for licenses to engage, either for pleasure or for work, in activities controlled because they impose costs on others; and
(5) income from business transactions.

Within each of these five categories, Vandermeulen identifies various principles and guidelines for setting fees. Fees may be set in one of three basic ways: to recover all of the costs of providing the service, or above or below this level depending on the associated benefits or costs to the public at large.

Fees and licenses in the first category allow individuals to engage in certain occupations or business activity, and are generally neutral in character to minimize interference with private business. Neutrality means the fee (or tax) will not unnecessarily or unintentionally interfere with private economic decisions.

These fees are generally set at a rate sufficient to recover the costs of administration and enforcement. Examples of fees in this category include building permits, occupation licenses (plumber, electrician, barber, etc.), meat and produce inspection fees, restaurant licenses and concession permits.

The second category involves the record keeping functions of government. Fees

in this category generally reflect the full cost of the benefit received. However, Vandermeulen suggests that, fees for issuing duplicate records may be set higher since carelessness on the part of the user is often involved. Examples of fees in this category include birth certificate copy fees, transcript fees, change of address fees and duplicate license fees.

The third category includes those fees associated with public health, recreation, and education services. The user's ability to pay for the service is generally the overriding principle in considering the fee schedule for this category. Ability to pay is one way of evaluating state and local tax burden and means that a taxpayer should pay according to his or her available resources; therefore fees in this category frequently recover only a portion of the cost of the service.

This is in contrast to most fees which are generally considered in terms of the benefits-received principle of taxation where a taxpayer who benefits from a government service pays its costs.

Another argument for lower fees in this category is the indirect benefits to society at large, even though the service may be rendered to a specific group of individuals. Examples of fees in this category include tuition, clinic charges, social service application fees and museum admission fees.

The fourth category includes fees for licenses that are required before engaging in a particular activity that has inherent social costs. The most common example of such an activity is driving. Various licenses and fees are required for the privilege of owning and operating a motor vehicle. The driver benefits directly from the privilege to drive, but there are additional social costs involved such as highway wear and the costs associated with traffic control and accidents. By assessing a fee, the driver shares a portion of these additional costs. A charge that simply covers the cost of issuing the various licenses does not address the many indirect costs involved in the activity.

Hunting and fishing license fees are another example of those charges that may reflect some of the costs incurred beyond the basic administration of the licenses. The expense of managing the natural resources and the depletion and replenishment of fish and game are indirect costs that are borne in part by those engaged in the activity if the fee is set higher than the basic cost of issuing the license.

The last category includes those fees and charges assessed as part of business transactions such as oil and gas leases, land sales and property rentals. The guiding principle for setting these fees is generally fair market value rather than the cost of supporting a particular activity. These are similar to transactions in the private sector, and as in the private sector, government should attempt to maximize revenue from these fees in most cases.

Another set of useful guidelines has been developed by political economists John Due and Ann Friedlaender for determining when it might be appropriate to expand the role of fees in government finance. According to these guidelines, user fees should be considered when:

(1) benefits are primarily direct, toward an individual, rather than the community as a whole;
(2) substantial waste of the service will occur if it is provided free of charge;
(3) charges do not result in inequities to lower-income groups, on the basis of accepted standards; and
(4) costs of collection of charges are relatively low.

Due and Friedlaender say that user fees should be avoided when:

(1) the benefits are enjoyed, at least in part, by the public at large so that charging a fee would result in the fee payer subsidizing the general

public;

(2) little waste will occur if the services are provided free of charge;

(3) equity standards require that lower-income groups be assured of obtaining the services; and

(4) collection costs are relatively high.

Advantage of User Fees

As with all revenue alternatives there are advantages and disadvantages to be considered. One advantage of user fees is their similarity to prices. Fees can improve the efficiency and equity of a revenue system and also enjoy broad public support.

Efficiency--measuring public demand. Financing selected government services through user charges shifts decisions regarding preferences for public services from the political process directly to the consumer. User fees provide governments with important information that can be evaluated in terms of the quality and quantity of services the public desires. When rates are set appropriately, this consumer demand information can be used to test new or expanded services such as more frequent trash collection. Government is also a better position to respond quickly to changing public demands because immediate and relatively reliable information is available. In the case of a service no longer desired by the public, government can more quickly--and efficiently--shift scarce resources into other areas.

Some economists argue that the overall efficiency of a government's revenue system is improved when user fees result in a reduction in high marginal tax rates. Tax rates are more likely to cause economic distortions when they are high relative to neighboring jurisdictions. By increasing user fees to reduce marginally high tax rates, these distortions can be reduced.

Finally, user fees can help correct private market prices and costs that do not otherwise account for certain indirect social costs. For example, industrial waste charges can recover a portion of the cost of pollution to the public as well as provide and incentive to industry for reducing pollution.

Equity. In some cases, user charges can be a more equitable means of financing government than general tax revenue. If the service involves a specific group of users, then supporting that activity through general tax revenue causes nonusers to subsidize those benefiting from the service. For example, it may be questionable for the taxpaying public to support a municipal golf course or swimming pool from general tax revenue.

Other groups that may benefit at the expense of the general public are nonresidents and nonprofit organizations. By paying user fees, these groups can contribute to the support of the services which they enjoy. Tourists, for example, help to support state parks through user fees, otherwise the taxpaying public would be subsidizing out-of-state visitors.

Public support. According to a series of opinion polls, the public prefers user fees over all other available revenue options. The U.S. Advisory Commission on Intergovernmental Relations conducts an annual poll which includes questions regarding the best way for governments to raise additional revenue. In its 1986 survey, 49 percent of respondents preferred local user taxes compared to 26 percent for the local sales tax, the next most popular option. The property tax and income tax were favored by seven percent and nine percent respectively.

A public opinion survey conducted by the Lyndon B. Johnson School of Public Affairs for the Select Committee on Tax Equity also found strong support for user fees. When asked if heavy users of government services should be required to pay a greater share of the revenue burden, 68 percent responded that they agreed strongly with this statement.

Disadvantages of User Fees

As with any revenue source, there are a number of disadvantages that must be weighed when fees are considered. In many cases the disadvantages of user fees can be

addressed through the fee rate structure.

Regressivity. User fees tend to be regressive. In general, user fees take a larger portion of the low-income family's resources than that of the higher income family. However, there are other factors which tend to mitigate this effect and fees can be structured to account for a taxpayer's ability to pay.

For those services from which a low-income family does not generally benefit, equity may actually be improved with a shift to user fees, because they are no longer subsidizing others who benefit from the service. Additional adjustments can be made to the fee schedule to better account for the ability to pay since the users may be identified, but this may make the fee structure too complex.

Difficulty in determining costs. The expertise required to determine the actual costs, demand for and distribution of benefits of selected services is frequently beyond the resources of many government entities. In addition, the analysis may cross traditional departmental lines of government, further complicating the effort to determine total costs. The need for technical analysis in determining costs has given rise to the development of a new industry: consulting firms whose sole business is to assist state and local government in reviewing and evaluating their user fee system.

A number of studies have recommended state level technical assistance for local governments in determining costs of services. The state can also perform the role of "clearinghouse" and provide local governments with information regarding user charges and rates successfully used elsewhere.

Nondeductibility. Unlike property and income taxes, user fees are not deductible on federal income tax forms. In states with a personal income tax, there is a bias toward deductible taxes. The issue has become less important for some states, including Texas, since the federal Tax Reform Act of 1986 eliminated the deductibility of a sales tax, eliminating a tax bias.

Revenue sharing. Another disadvantage that has become less significant as a result of recent federal changes involves revenue sharing. The federal revenue sharing program that was repealed in 1986, distributed funds to local governments based on a formula that included tax effort, a statistical measure of how extensively the government used various tax sources. Local governments with a greater reliance on user fees were at a disadvantage in competing for these funds.

Although this is no longer an issue in terms of federal revenue sharing, many states distribute funds to local governments using formulas that include local tax effort. If a broader definition of local effort were used in the distribution formulas, the bias toward taxes as a source of local revenue could be reduced or eliminated.

Inherent disincentives. Like prices, high fees can reduce the demand for a service. Government officials may not support revenue alternatives that have the effect of reducing the demand for services they advocate.

For example, museum officials are not likely to support and entrance fee increase from 50 cents to $2.00 if the result is to reduce visitation by 50 percent, even if a greater percentage of the operating costs are covered. Since public support for the museum is demonstrated by number of visitors, museum officials cannot be expected to support a policy change that would have the effect of reducing visitation. In addition, government agencies and departments may not advocate fees or fee increases since additional fee revenue could be used to replace general revenue rather than supplement it.

The political process can also complicate rate setting as observed by a budget officer in San Antonio, 'the principal limitations to expansion or increase in charges would be political with considerations given to local economic conditions, equity, and ability to pay.'

Revenue performance. Fees are generally set at a flat rate and as a result, revenue tends to erode over time with inflation. Periodic adjustments are required to account for the effects of inflation unless some form of indexing is used. Indexing has not been widely used as a solution to the effects of inflation."

Application to Transfer of Water Out of Basin

A severance tax could be used to generate revenue to pay for third party impacts, either by applying it to all water withdrawn from a stream, exempting all but the quantities to be shipped out of basin, or by defining the transport of water out of basin to be an occupation and applying the tax to the occupation of transporting water out of basin. Since most of the transfers will be done by public entities that are exempt from taxation, statutory language allowing public entities to make payments in lieu of taxes to be needed.

The world of fees is equally confusing. If not properly applied a fee may be found by the courts to be a tax, subject to the equity and other rule of taxation. Fees are normally designed to pay for a public service provided by government where the payer has the option of not participating in the service to avoid the tax--this is clearly not the case with interbasin transfer of water. Other fees may be so-called "special assessments" and is probably the right idea for the transfer fee. The example of the transport fee for underground water districts is probably the right example to follow since this is a recent addition to the state tax system. These fees can apparently be varied by case to fit the purposes of the District, so long as they are "reasonable".

Appendix B
Documentation of Relevant National Examples of Third-Party Compensation

Davis-Grunsky Act

(State of California)

Public agencies have been awarded loans and grants through the Davis-Grunsky Act since 1959. The Act is jointly administered by the Department and the California Water Commission and was designed as complementary legislation to the Burns-Porter Act, which was enacted to help finance construction of the SWP.

Of the original $1.75 billion made available through the Burns-Porter Act, $130 million was reserved specifically for distribution through provisions of the Davis-Grunsky Act. Monies are paid from the California Water Resources Development Fund and the California Water Fund. Loans are repaid to the California Water Resources Development Fund.

Basic Provisions

The broad objective of the Davis-Grunsky Act is to advance the development, control, and conservation of water resources in California. To meet that objective, the Act is designed to:

provide loans to public agencies for preparing feasibility reports and constructing local water projects if the agencies cannot obtain financing on reasonable terms from other sources;

provide grants to encourage development of the recreational aspects of local water projects and fish and wildlife habitat; and

enable California to participate as a partner in the development, construction, or operation of certain water projects when participation is necessary for optimum development of resources.

Public agencies, including cities, counties, districts, or other political subdivisions of the State, may participate in the program. Types of assistance available include:

loans for constructing local water projects, acquiring sites for reservoirs for proposed water projects, and preparing feasibility reports on proposed projects for which loans have been requested;

grants for paying the part of the construction cost of dams and reservoirs that are properly allocated to provide recreation, enhance fish and wildlife, and

construct initial water supply and sanitary facilities needed for public recreational use of reservoirs; and

state participation as a partner in a project larger than one that the local agency proposed to construct on its own.

At the program's inception, loans were made at the current market interest rate. In 1967, to be more equitable to the low-income agencies that the program was designed to assist, the Legislature fixed the interest rate at 2.5 percent. The maximum loan repayment period was set at 50 years. At the Department's discretion however, some agencies were given an initial 10-year deferment with the accumulated interest amortized over the repayment period.

Through 1994, approximately $128.5 million of the allocated $130 million had been disbursed or contracted for loans, grants, and administrative costs. The remaining $1.5 million has been allocated to complete the grant to Littlerock Creek Irrigation District and Palmdale Water District to rehabilitate Littlerock Dam.

Delta Protection Act

(State of California)

The Delta Protection Act was enacted in 1959 at the same session of the Legislature at which the Burns-Porter Act was enacted.

12200. The Legislature hereby finds that the water problems of the Sacramento-San Joaquin Delta are unique within the State; the Sacramento and San Joaquin Rivers join at the Sacramento-San Joaquin Delta to discharge their fresh water flows into Suisun, San Pablo and San Francisco Bays and thence into the Pacific Ocean; the merging of fresh water with saline bay waters and drainage waters and the withdrawal of fresh water for beneficial uses creates an acute problem of salinity intrusion into the vast network of channels and sloughs of the Delta; the State Water Resources Development System has as one of its objectives the transfer of waters from water-surplus areas in the Sacramento Valley and the north coastal area to water-deficient areas to the south and west of the Sacramento-San Joaquin Delta via the Delta; water surplus to the needs of the areas in which it originates is gathered in the Delta and thereby provides a common source of fresh water supply for water-deficient areas. It is, therefore, hereby declared that a general law cannot be made applicable to said Delta and that the enactment of this law is necessary for the protection, conservation, development, control and use of the waters in the Delta for the public good.

(Added by Stats. 1959, Ch. 1766.)

12201. The Legislature finds that the maintenance of an adequate water supply in the Delta sufficient to maintain and expand agriculture, industry, urban, and recreational development in the Delta area as set forth in Section 12220, Chapter 2, of this part, and to provide a common source of fresh water for export to areas of The water deficiency is necessary to the peace, health, safety and welfare of the people of the State, except that delivery of such water shall be subject to the provisions of Section 10505 and Sections 11460 to 11463, inclusive, of this code.

(Added by Stats. 1959, Ch. 1766.)

12202. Among the functions to be provided by the State Water Resources Development System, in coordination with the activities of the United States in providing salinity control for the Delta through operation of the Federal Central Valley Project, shall be the provision of salinity control and an adequate water supply for the users of water in the Sacramento-San Joaquin Delta. If it is determined to be in the public interest to provide a substitute water supply to the users in said Delta in lieu of that which would be provided as a result of salinity control no added financial burden shall be placed upon said Delta water users solely by virtue of such substitution. Delivery of said substitute water supply shall be subject to the provisions of Section 10505 and Sections 11460 to 11463, inclusive, of this code.

(Added by Stats. 1959, Ch. 1766.)

12203. It is hereby declared to be the policy of the State that no person, corporation or public or private agency or the State or the United States should divert water from the channels of the Sacramento-San Joaquin Delta to which the users within said Delta are entitled.

(Added by Stats. 1959, Ch. 1766.)

12204. In determining the availability of water for export from the Sacramento-San Joaquin Delta no water shall be exported which is necessary to meet the requirements of Sections 12202 and 12203 of this chapter.
(Added by Stats. 1959, Ch. 1766.)

12205. It is the policy of the State that the operation and management of releases from storage into the Sacramento-San Joaquin Delta of water for use outside the area in which such water originates shall be integrated to the maximum extent possible in order to permit the fulfillment of the objectives of this part.

(Added by Stats. 1959, Ch. 1766.)

PUBLIC LAW 101-618 (PL 101-618) [Nevada and California]—Omnibus legislation passed by the 101st Congress at the end of its 1990 session intended to settle a number of outstanding disputes concerning the Truckee and Carson Rivers. The legislation authorized an ambitious environmental restoration program to benefit the Lahontan Valley Wetland System [Nevada] and Pyramid Lake and the lower Truckee River. It also established a framework for resolving separate by closely-related water-resource conflicts involving the Pyramid Lake Paiute and Fallon Paiute-Shoshone Tribes, the cities of Reno and Sparks (Nevada), the states of Nevada and California, and (pending the resolution of several as-yet unsatisfied controversies) the Newlands (Irrigation) Project [Nevada]. The legislation contains two primary titles: TITLE I—The Fallon Paiute-Shoshone Indian Tribal Settlement Act; and TITLE II—The Truckee-Carson-Pyramid Lake Water
Rights Settlement Act. Collectively, the legislation can be referred to as the Negotiated Settlement. The seven (7) main elements covered by the legislation include:

[1] Promote the Enhancement and Recovery of Endangered and Threatened Fish Species—A recovery program is to be developed for the Pyramid Lake endangered fish species cui-ui (Chasmistes cujus) and the threatened fish species Lahontan cutthroat trout (Oncorhynchus clarki henshawi) in compliance with the Endangered Species Act (ESA) and the Truckee-Carson-Pyramid Lake Water Rights Settlement Act. Water rights acquisitions are authorized for this purpose.

[2] Protect Wetlands from Further Degradation—A water rights purchase program is authorized for Lahontan Valley Wetlands, with the intent of sustaining an average of 25,000 acres of wetlands (Stillwater National Wildlife Refuge: 14,000 acres; Carson Lake and Pasture: 10,200 acres; and Fallon Reservation and Indian Lakes: 800 acres) to both prevent further degradation and improve the habitat of the fish and wildlife which depend on those wetlands. The U.S. Fish and Wildlife Service (USFWS) has estimated that this will require up to 125,000 acre-feet (AF) of water per year.

[3] Encourage the Development of Solutions for Demands on Truckee River Waters—An operating agreement is to be negotiated for the Truckee River—The Truckee River Operating Agreement (TROA)—covering procedures for using storage capacity in upstream reservoirs in California consistent with recovery objectives for listed Pyramid Lake fishes. This includes the implementation of the terms and conditions of the Primary Settlement Agreement (PSA) between SPPCo and the Pyramid Lake Paiute Tribe.

[4] Improve Management and Efficiency of the Newlands Project—The Secretary of the Interior is authorized to operate and maintain the Newlands Project to serve additional purposes, including recreation, improved water quality flowing to the wetlands, improved fish and wildlife habitat, and municipal water supply for Lyon and Churchill counties. A project efficiency study is required. The 1973 Gesell Decision is recognized and the 1988 Operating Criteria and Procedures (OCAP) is to remain in effect at least through 1997.

[5] Fallon Paiute-Shoshone Water Issues Settlement—Establishment of a settlement fund for the Fallon Paiute-Shoshone Tribe totaling $43 million. The Tribe is authorized to purchase land and water rights to consolidate tribal holdings within the reservation. Specific litigation filed by the Tribe is to be dismissed.

[6] Pyramid Lake Paiute Tribe Issues Settlement—A tribal economic development fund of $40 million was established for the Pyramid Lake Paiute Indian Tribe to provide for the settlement of water, fish, and other issues. Another fund of $25 million was established for the Pyramid Lake fishery.

[7] Interstate Water Apportionment Settlement—Facilitate an interstate allocation of the waters of the Truckee River, Carson River, and Lake Tahoe between the states of California and Nevada. Also see Truckee River Agreement [Nevada and California].

Appendix C
The Measurement of the Income Value of Water

1. Market Values of Water at Current Use Levels [1]

Fish/Wildlife & Recreation ($8 per acre-foot)

Marginal value of water in use derived by using a contingent valuation method.

Industrial ($282 per acre-foot)

An average of estimated water values from several studies of key U.S. water using industries, including chemicals, paper, minerals, sugar beet, cotton textile and meat packing enterprises. Methodology based on the marginal cost of internal recycling.

Municipal ($194 per acre-foot)

An average of estimated consumer surplus values of water for 10% incremental changes in consumption, for three different regions of the nation, and separately for winter and summer use.

Rice ($86 per acre-foot)

The marginal value of water is estimated using long-run farm crop budgets.

Lakeside Property Values ($650 per foot of lake level)

The marginal price of lake level deviation is the implicit price of that characteristic obtained from the first partial derivative of the hedonic price function. The marginal prices are for a typical 2,363 square foot house with two car garage, in average condition.

2. Costs

Toledo Bend to Houston

The capital cost of transportation is based on data from a 1998 study of interbasin transfer options for the southeast area of Texas; Texas Water Development Board, et al, *Trans-Texas Water Program: Southeast Area, Technical Memoranda*, April 1998, p. 35. Pumping cost are based on data from a 1984 study of a planned water treatment plant for the City of Austin; Black and Vetch, et al, *Water Treatment Plant No. IV: A Report Prepared for the City of Austin Water and Waste Water Department*, 1985 and are $0.33 per 1,000 gallons per foot of lift. The cost of service rate of $16.25 per acre-foot is based on phone conversations with Mr. Albert Gray of the Sabine River Authority (March 8, 1999) and TNRCC staff member, Mr. Terry Slade (December 21, 1998).

LCRA to San Antonio

The capital costs were based on the actual cost per acre-foot of capacity of a recently constructed pipeline from Lake Texana to Corpus Christi ($125 million for a capacity of 108 thousand

[1] Fish/Wildlife and Recreation, Industrial, Rice values are taken from K. Frederick, T. Vandenberg, J. Hanson, "Economic Values of Freshwater in the United States" *Discussion Paper 97-03, Resources for the Future, October 1996.* Lakeside Property Values taken from N. Lansford, L. Jones "Effects of LCRA Lakes on Riparian Property Values" *Technical Report No. 170, Texas Water Resources Institute.*

acre feet per year). Cost of transportation for LCRA to San Antonio estimated at $115 million or $1,157 per acre-foot of capacity. Pumping cost are $0.33 per 1,000 gallons per foot of lift. It is estimated that San Antonio will pay $105 per acre-foot of raw water (based on the price LCRA's current cost of service).

Lower Colorado to Corpus Christi

The point of diversion would occur at the facilities currently used in the City of Corpus Christi agreement with Garwood Irrigation Company and may amount to a maximum diversion of 35,000 acre-feet per year to be transported through the Lake Texana to Corpus Christi pipeline. The capital cost of the project is based on the actual cost of constructing the Lake Texana to Corpus Christi pipeline of $1,157 per acre-foot of capacity. Pumping cost are $0.33 per 1,000 gallons per foot of lift.

3. Income Value of Water

The income value of water as defined by economists means the amount of income individuals can generate by "using" it for purposes that are traded in the market place, plus the amount of money individuals would be willing to pay for the privilege of using water in the case of purposes *not* traded in the market place. Simply having water available, we also call a "use". Individual companies, for example, buy water for cooling and cleaning in an industrial process, which contributes to the firm's ability to earn a profit and pay wages. Individuals, in another example, are willing to pay for the privilege of boating or other recreation on a lake, even though they are not required to pay. Economists have developed methods of measuring such willingness to pay, based on what people spend for travel to enjoy the lake or by carefully designed interviewing techniques.

By following the methodologies developed by economists, one can develop consistent measures of the economic value of water for industrial processing, power generation, municipal use, recreation, and aesthetic pleasures, the values of which can be summed to obtain a reasonable estimate of the total income value of water to the users. By adding one additional step, that of the multiplier effect of incremental income generated in a regional economy from the use of an increment of water in a sector that would otherwise be deprived of it, one can estimate how much money a region would be willing to pay for developing additional water supplies. Such methods can be used to evaluate how much could reasonably be paid for additional water supplies, either by investing in impoundment facilities, or importing water from neighboring regions. Such methods can also be used to evaluate the reasonableness of conservation programs designed to avoid having to develop new supplies.

The concept of income generated in the various regions per unit of water used in the examples in this study follow the methodology developed in the 1960s in the eight year long evaluation of the proposed Central Arizona Project (CAP). The studies were completed by researchers in the Department of Agricultural Economics at the University of Arizona. The methods have not been materially improved upon since the studies were completed, because the researchers made use of standard theories and measurement techniques employed in natural resource economics for over a

half century. The CAP study has been widely referenced in the economics literature on the economics of water resource investments.[2]

The direct, gross income value associated with an incremental supply of water made available to an industry that would otherwise loose the water is the income portion of the gross effect of that water loss on the value of output of the sector. That is, if $1,000 of agricultural production would be lost by reduction of an acre-foot of irrigation water, and the income paid to the associated unit of labor, management, and capital is 25% (the cost of the increment of water is not in the other 75% of production expenses) then the gross income loss (of water) is $250. This gross income value is assumed in this example to be divided among the three contributors as $100 to the owners of capital (land and equipment), $100 to labor and $50 to management.

The above mentioned $250 **gross** income value is the difference in income to incremental labor, management and capital required for use of the marginal unit of water to produce the $1,000 of output. This would be the direct, **net** income value of water only if the three income losers had no chance of alternative employment in the economy. If one determined how much each income earner would pay not to loose the acre-foot of water, it would be the amount of the above values, less the opportunity cost of each. The result is the **net** income value of the acre-foot of water. If the owner of capital (land plus equipment) could earn $90 in another investment, $10 is the most he would pay to have the acre-foot of water; if the laborer could get another job at a $95 wage rate, then he would pay $5 to have the water available; and if management could get $40 for his management skills elsewhere, then he would pay only $10 to have the water. Therefore, in this example, the direct, **net** income value of the water is $25 ($10+$5+$10=$25), not $250.

Since the irrigated agriculture sector is related to other sectors in the economy, then a change in output of irrigated agriculture will impact the sales (output) of other sectors, where the same calculus (discussed above) of net income effects should be applied. This is the indirect income value of water. Such an indirect income value can be derived from input-output models of the economy that identify "value added" by industry sector, and may be a factor of 1.2, for example, times the direct net income effect.[3] In this example the indirect effect of the $25 net income loss is $30, and the total net income loss is $55 ($25 direct + $30 indirect) per acre-foot. The same type of calculus can be applied to sectors other than agriculture that might be short of water at current prices.

In economic theory, applied to water resource economics, the conceptual measure of the income value of water is the area under a demand curve and above the marginal cost curve (supply curve) for the water. The text book marginal revenue curve for a commodity (such as water) used as a input to the production of a particular output (or as a final consumer item), is usually derived with other input prices held constant, but with the substitution of other inputs (or consumer items) for water as the price of water rises. The marginal revenue curve used in the examples in this study are also assumed to be measured with income held constant along the demand curve (an income

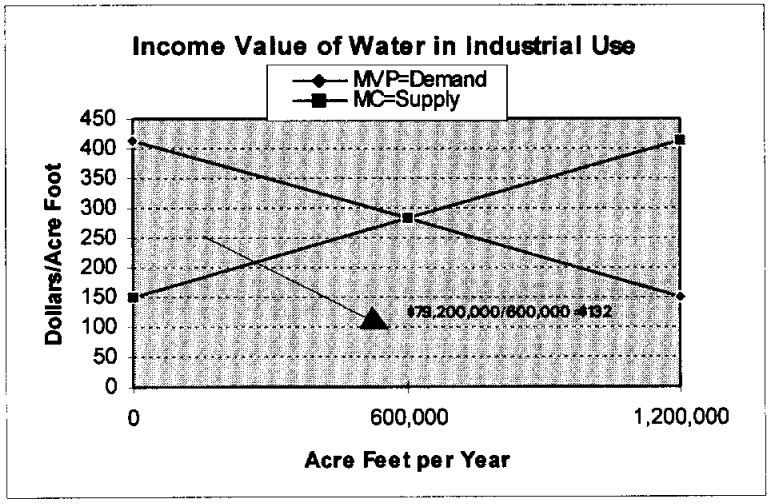
[2] Kelso, Maurice M., William E. Martin and Lawrence E. Mack, *Water Supplies and Economic Growth in an Arid Environment: An Arizona Case Study*, The University of Arizona Press, Tucson, 1973.

[3] Note: Such a multiplier would have to be uniquely calculated for each regional input-output model, based on the reasonable opportunity cost adjustment for labor and capital in each economic sector.

compensating demand curve). That is, there is no loss of real income as the price of water rises, all other prices being constant. We therefore take the income value of water as calculated below to be the *net* income value of water.

A thorough study of the topic of the income value of water would most likely start with the value added estimate in an input-output model for the sector where incremental water supplies are to be analyzed. The value added change associated with a change in output of the sector related to the incremental change in the supply of water to the sector is an estimate of the direct, gross income value of that increment of water. This value added estimate is an estimate of an incremental change in water as an input with all prices and relative quantities of purchased inputs held constant. Therefore, one would need to adjust the value added (gross income value of the increment of water) estimate downward by the opportunity cost of land, labor, management, and capital to arrive at an estimate of the *direct, net* income value of water. By using output multipliers, one can then estimate the change in output of all other sectors in the economy, associated with the change in the output of the directly impacted sector. The change in each sector's value added associated with such an output change can then be calculated to get the *indirect, gross* income impact of the water increment in question. These gross income estimates would then need to be adjusted for the opportunity cost of land, labor, management, and capital, as in the case of the direct income change.

The data used for the industrial income value of water is shown graphically below. Note that due to the simple form of the MC and MR curves, the geometric area between the two curves is also obtained by \$282-\$150=\$132. A like calculation was made for municipal and agricultural use.



Recreation/fish and wildlife economic values were assumed to be constant over the relevant range of a demand curve at \$8.oo per acre-foot, with zero MC. Texas law requires the Texas Parks and Wildlife Department to limit project effects on stream flow to prevent loss of fish and wildlife. The implementation of such limitations is to minimize the impacts to the maximum extent possible through minimum flow criteria and to require mitigation of impacts not prevented.[4] It is unclear how much of an impact in the Sabine below Toledo Bend might accompany a large scale diversion

[4] Phone conversation with Mr. Ray Mathews, Texas Water Development Board, July 20, 1999.

of water out of Toledo Bend, given TPWD minimum flow requirements in the Sabine. The same question arises in the case of the lower Colorado in the Lower Colorado-to-San Antonio transfer example. It was assumed that there would be impacts requiring mitigation by third party payments by the user (importer). Housing values are related to the lake level at the margin and it is assumed that any property value loss at the time of sale of the property is equivalent to individual income loss in the period.

The multipliers for converting direct net income changes to economy-wide estimates were based on the Texas Input-Output Model, last updated to represent year 1986. For the Sabine area it was assumed that the alternative use of the exported water was for future industrial sector development with a probability of 10% in the Sabine region. Therefore, the manufacturing industry income multiplier of 1.91 was used, meaning that the total net income loss to the Sabine was ($282-$150=$132)*1.91*0.10=$25.21 per acre-foot. In Houston the calculation included the mix of future industrial and municipal water use with probability of 100%, so that the direct net income value estimate was ($114.25-$16.25=$98)*2.31*1.00=$226.38 per acre-foot (before subtracting transportation cost), where the $16.25 value is the purchase price of raw water in the Sabine and 2.31 is the income multiplier for Houston. The estimate of $114.25 is the weighted average of industrial and municipal net income. Note that since a total economy income multiplier was not available for the Texas Input-Output model, the multiplier for the water and wastewater sector of 2.31 was used. Similar calculations were made for the other two examples of LCRA to San Antonio and Lower Colorado to Corpus Christi.[5]

The income value of water in different applications may vary widely so that the estimates used here may miss the mark for the examples presented. For example, the marginal value of water in industrial uses may be as high as $802 per acre-foot for use in the meat packing industry. This particular estimate of $802 was based on the marginal cost of wastewater recycling. The $282 estimate is an average of a number of industries from a number of separate studies for locations throughout the U.S., so the numbers certainly might be different for the Houston, San Antonio or Corpus Christi areas as would be revealed in a detailed study of the topic. Houston and Corpus Christi, however, have a heavy concentration of refinery and chemical industry plants in their industrial mix, industries which tend to have lower costs of recycling than many other industries, therefore the estimate used here is probably reasonable. The slopes of the supply and demand curves are fictitious, designed for ease of calculation.

[5] Note: The multipliers of 1.91 and 2.31 will only be accurate for the purposes here applied if the opportunity cost of labor and capital bear the same relationship to value added in that sector as is true for the directly impacted sector.

Appendix D
Detailed Calculations for the Three Examples

Appendix Table 1. Third Party Impacts and Transfer Fee: East Texas to Houston

Impact/Item	Exporting Basin			Importing Basin			Transport Costs				Transfer Fee (3)		Annual Payment to Exporting Region
	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Cost/Unit Transported	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transportation	Excluding Transportation	
Sabine to Houston IBT		dollars/ac.ft.	(dollars)		(dollars/ac.ft.	(dollars)	(dollars)	(dollars)	(dollars)		$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 200,000 ac. ft./yr in 2010													
State Owned Transport System (1)							($125)	($24,907,863)	($24,907,863)		$125		
Fish & Wildlife	100%	($1.91)	($1,120,640)	100%	$2.39	$1,400,800			$280,160		$6	$6	
Lake Side Property Values	0%	$0	$0	0%	$0	$0			$0		$0	$0	
Economic Development Income(	10%	($12)	($4,705,313)	100%	$98	$45,276,838			$40,571,525		$24	$24	
Total			($5,825,953)			$46,677,638			$15,943,822	$7,971,911	$40	$40	
											$194	**$69**	**$13,797,864**
b. Flow @ 400,000 ac. ft./yr in 2030													
State Owned Transport System (1)							($89)	($35,660,913)	($35,660,913)		$89		
Fish & Wildlife	100%	($1.91)	($2,241,280)	100%	$2.39	$2,801,600			$560,320		$6	$6	
Lake Side Property Values	0%	$0	$0	0%	$0	$0			$0		$0	$0	
Economic Development Income(	10%	($12)	($9,410,626)	100%	$98	$90,553,677			$81,143,050		$24	$24	
Total			($11,651,906)			$93,355,277			$46,042,457	$23,021,229	$58	$58	
											$176	**$87**	**$34,673,135**
c. Flow @ 600,000 ac. ft./yr in 2050													
State Owned Transport System (1)							($77)	($46,413,963)	($46,413,963)		$77		
Fish & Wildlife	100%	($1.91)	($3,361,920)	100%	$2.39	$4,202,400			$840,480		$6	$6	
Lake Side Property Values	0%	$0	$0	0%	$0	$0			$0		$0	$0	
Economic Development Income(	10%	($12)	($14,115,940)	100%	$98	$135,830,515			$121,714,576		$24	$24	
Total			($17,477,860)			$140,032,915			$76,141,093	$38,070,546	$63	$63	
											$170	**$93**	**$55,548,406**

Notes:

(1) The cost of the transportation network is $607 per acre foot of capacity. The total cost is $607*600,000=$364,200,000, amortized at 3% real interest for 50 years = $14,154,813 per year. Pumping cost = $0.03/1000 gal/ft. lift.

(2) The marginal use of water in the region is unappropriated water, but assumed to be SRA water at $16.25/ac. ft. The income value of water is the direct and indirect regional income change as a result of the transfer.
The marginal income value of water in the basin of origin is $16.25 times the income multiplier for the manufactoring sector for the region.
The loss in the exporting region is a prospective one, equal to the direct plus indirect value multiplied by the probability of development occuring in the region.
The probability of economic development in the future is determined by subjective methods of a panel of experts. The income value in the receiving basin is the marginal value of water available in the region, minus the price of imported water, times the income multiplier for the water and wastewater utility sector in the receiving basin.

(3) The transfer fee is calculated with and without the transport system. The fee excluding transportation is an annual amount adequate to pay for the exporting region impact, plus 50% of the aggregate net income increase of the two regions.

Appendix Table 2. Third Party Impacts and Transfer Fee: East Texas to Houston, No Income Sharing

Impact/Item	Exporting Basin			Importing Basin			Transport Costs				Transfer Fee (3)		Annual Payment to Exporting Region
	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Cost/Unit Transported	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transportation	Excluding Transportation	
Sabine to Houston IBT		dollars/ac.ft.	(dollars)		(dollars/ac.ft.	(dollars)	(dollars)	(dollars)	(dollars)		$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 200,000 ac. ft./yr in 2010													
State Owned Transport System (1)							($125)	($24,907,863)	($24,907,863)		$125		
Fish & Wildlife	100%	($1.91)	($1,120,640)	100%	$2.39	$1,400,800			$280,160		$6	$6	
Lake Side Property Values	0%	$0	$0	0%	$0	$0			$0		$0	$0	
Economic Development Income(	10%	($12)	($4,705,313)	100%	$98	$45,276,838			$40,571,525		$24	$24	
Total			($5,825,953)			$46,677,638			$15,943,822	$0	$0	$0	
											$154	**$29**	**$5,825,953**
b. Flow @ 400,000 ac. ft./yr in 2030													
State Owned Transport System (1)							($89)	($35,660,913)	($35,660,913)		$89		
Fish & Wildlife	100%	($1.91)	($2,241,280)	100%	$2.39	$2,801,600			$560,320		$6	$6	
Lake Side Property Values	0%	$0	$0	0%	$0	$0			$0		$0	$0	
Economic Development Income(	10%	($12)	($9,410,626)	100%	$98	$90,553,677			$81,143,050		$24	$24	
Total			($11,651,906)			$93,355,277			$46,042,457	$0	$0	$0	
											$118	**$29**	**$11,651,906**
c. Flow @ 600,000 ac. ft./yr in 2050													
State Owned Transport System (1)							($77)	($46,413,963)	($46,413,963)		$77		
Fish & Wildlife	100%	($1.91)	($3,361,920)	100%	$2.39	$4,202,400			$840,480		$6	$6	
Lake Side Property Values	0%	$0	$0	0%	$0	$0			$0		$0	$0	
Economic Development Income(	10%	($12)	($14,115,940)	100%	$98	$135,830,515			$121,714,576		$24	$24	
Total			($17,477,860)			$140,032,915			$76,141,093	$0	$0	$0	
											$106	**$29**	**$17,477,860**

Notes:

(1) The cost of the transportation network is $607 per acre foot of capacity. The total cost is $607*600,000=$364,200,000, amortized at 3% real interest for 50 years = $14,154,813 per year. Pumping cost = $0.03/1000 gal/ft. lift.

(2) The marginal use of water in the region is unappropriated water, but assumed to be SRA water at $16.25/ac. ft. The income value of water is the direct and indirect regional income change as a result of the transfer.
The marginal income value of water in the basin of origin is $16.25 times the income multiplier for the manufactoring sector for the region.
The loss in the exporting region is a prospective one, equal to the direct plus indirect value multiplied by the probability of development occuring in the region.
The probability of economic development in the future is determined by subjective methods of a panel of experts. The income value in the receiving basin is the marginal value of water available in the region, minus the price of imported water, times the income multiplier for the water and wastewater utility sector in the receiving basin.

(3) The transfer fee is calculated with and without the transport system. The fee excluding transportation is an annual amount adequate to pay for the exporting region impact.

Appendix Table 3. Third Party Impacts and Transfer Fee: LCRA to San Antonio

Impact/Item	Exporting Basin			Importing Basin			Transport Costs				Transfer Fee (3)		Annual Payment to Exporting Region
	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Cost/Unit Transported	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transportation	Excluding Transportation	
LCRA to San Antonio IBT		(dollars/ac.ft	(dollars)		(dollars/ac.ft	(dollars)	(dollars)	(dollars)	(dollars)		$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 50,000 ac. ft./yr in 2010													
State Owned Transport System (1)							($126)	($6,285,974)	($6,285,974)		$126		
Fish & Wildlife	100%	($2)	($280,160)	100%	$2	$280,160			$0		$6	$6	
Lake Side Property Values	100%	($4)	($530,737)	0%	$0	$0			($530,737)		$11	$11	
Agricultural & Related Income /Economic Development Income(2)	20%	$0	($1,344,799)	100%	$50	$5,733,590			$4,388,791		$27	$27	
Total			($2,155,696)			$6,013,750			($2,427,920)	($1,213,960)	($24)	($24)	
											$145	**$19**	**$941,736**
b. Flow @ 75,000 ac. ft./yr in 2030													
State Owned Transport System (1)							($96)	($7,179,800)	($7,179,800)		$96		
Fish & Wildlife	100%	($2)	($420,240)	100%	$2	$420,240			$0		$6	$6	
Lake Side Property Values	100%	($5)	($1,193,714)	0%	$0	$0			($1,193,714)		$16	$16	
Agricultural & Related Income /Economic Development Income(2)	50%	$1	($5,042,995)	100%	$50	$8,600,385			$3,557,390		$67	$67	
Total			($6,656,949)			$9,020,625			($4,816,124)	($2,408,062)	($32)	($32)	
											$152	**$57**	**$4,248,887**
c. Flow @ 100,000 ac. ft./yr in 2050													
State Owned Transport System (1)							($81)	($8,073,626)	($8,073,626)		$81		
Fish & Wildlife	100%	($2)	($560,320)	100%	$2	$560,320			$0		$6	$6	
Lake Side Property Values	100%	($7)	($2,121,763)	0%	$0	$0			($2,121,763)		$21	$21	
Agricultural & Related Income /Economic Development Income(2)	100%	$1	($13,447,986)	100%	$32	$7,484,705			($5,963,281)		$134	$134	
Total			($16,130,069)			$8,045,025			($16,158,670)	($8,079,335)	($81)	($81)	
											$161	**$81**	**$8,050,733**

Notes:

(1) The cost of the transportation network is $125 million. Amortized at 3% real interest for 50 years = $4,498,321 per year. Pumping costs are $0.03/1000 gal/ft. lift.

(2) The marginal use of water in the region is LCRA firm yield water at $105/ac. ft. The income value of water is the direct and indirect regional income change as a result of the transfer.
The marginal income value of water in the basin of origin is $105 times the income multiplier for the water and wastewater utility sector for the region.
The loss in the exporting region is a prospective one, equal to the direct plus indirect value multiplied by the probability of development occuring in the region.
The probability of economic development in the future is determined by subjective methods of a panel of experts. The income value in the receiving basin is the marginal value of water available in the region, minus the price of imported water, the income multiplier for the water and wastewater utility sector in the receiving basin.

(3) The transfer fee is calculated with and without the transport system. The fee excluding transportation is an annual amount adequate to pay for the exporting region impact, plus 50% of the aggregate net income increase of the two regions.

Appendix Table 4. Third Party Impacts and Transfer Fee: LCRA to San Antonio, No Income Sharing

Impact/Item	Exporting Basin			Importing Basin			Transport Costs				Transfer Fee (3)		Annual Payment to Exporting Region
	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Cost/Unit Transported	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transportation	Excluding Transportation	
LCRA to San Antonio IBT		(dollars/ac.ft	(dollars)		(dollars/ac.ft	(dollars)	(dollars)	(dollars)	(dollars)		$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 50,000 ac. ft./yr in 2010													
State Owned Transport System (1)							($126)	($6,285,974)	($6,285,974)		$126		
Fish & Wildlife	100%	($2)	($280,160)	100%	$2	$280,160			$0		$6	$6	
Lake Side Property Values	100%	($4)	($530,737)	0%	$0	$0			($530,737)		$11	$11	
Agricultural & Related Income /Economic Development Income(2)	20%	$0	($1,344,799)	100%	$50	$5,733,590			$4,388,791		$27	$27	
Total			($2,155,696)			$6,013,750			($2,427,920)	$0	$0	$0	
											$169	**$43**	**$2,155,696**
b. Flow @ 75,000 ac. ft./yr in 2030													
State Owned Transport System (1)							($96)	($7,179,800)	($7,179,800)		$96		
Fish & Wildlife	100%	($2)	($420,240)	100%	$2	$420,240			$0		$6	$6	
Lake Side Property Values	100%	($5)	($1,193,714)	0%	$0	$0			($1,193,714)		$16	$16	
Agricultural & Related Income /Economic Development Income(2)	50%	$1	($5,042,995)	100%	$50	$8,600,385			$3,557,390		$67	$67	
Total			($6,656,949)			$9,020,625			($4,816,124)	$0	$0	$0	
											$184	**$89**	**$6,656,949**
c. Flow @ 100,000 ac. ft./yr in 2050													
State Owned Transport System (1)							($81)	($8,073,626)	($8,073,626)		$81		
Fish & Wildlife	100%	($2)	($560,320)	100%	$2	$560,320			$0		$6	$6	
Lake Side Property Values	100%	($7)	($2,121,763)	0%	$0	$0			($2,121,763)		$21	$21	
Agricultural & Related Income /Economic Development Income(2)	100%	$1	($13,447,986)	100%	$32	$7,484,705			($5,963,281)		$134	$134	
Total			($16,130,069)			$8,045,025			($16,158,670)	$0	$0	$0	
											$242	**$161**	**$16,130,069**

Notes:

(1) The cost of the transportation network is $125 million. Amortized at 3% real interest for 50 years = $4,498,321 per year. Pumping costs are $0.03/1000 gal/ft. lift.

(2) The marginal use of water in the region is LCRA firm yield water at $105/ac. ft. The income value of water is the direct and indirect regional income change as a result of the transfer.
The marginal income value of water in the basin of origin is $105 times the income multiplier for the water and wastewater utility sector for the region.
The loss in the exporting region is a prospective one, equal to the direct plus indirect value multiplied by the probability of development occuring in the region.
The probability of economic development in the future is determined by subjective methods of a panel of experts. The income value in the receiving basin is the marginal value of water available in the region, minus the price of imported water, the income multiplier for the water and wastewater utility sector in the receiving basin.

(3) The transfer fee is calculated with and without the transport system. The fee excluding transportation is an annual amount adequate to pay for the exporting region impact.

Appendix Table 5. Third Party Impacts and Transfer Fee: Garwood to Corpus Christi

Impact/Item	Exporting Basin			Importing Basin			Transport Costs				Transfer Fee (3)		Annual Payment to Exporting Region
	Probability of Agricultural Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Cost/Unit Transported	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transportation	Excluding Transportation	
Garwood to Corpus Christi IBT		(dollars/ac.ft	(dollars)		(dollars/ac.ft	(dollars)	(dollars)	(dollars)	(dollars)		$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 25,000 ac. ft./yr in 2010													
State Owned Transport System (1)							($79)	($1,968,239)	($1,968,239)		$79		
Fish & Wildlife	100%	($2)	($140,080)	100%	$2	$140,080			$0		$6	$6	
Lake Side Property Values	0%	$0	$0	100%	$4	$265,369			$265,369		$0	$0	
Agricultural & Related Income /Economic Development Income(2)	100%	$0	($1,318,937)	100%	$70	$4,068,401			$2,749,464		$53	$53	
Total			($1,459,017)			$4,473,850			$1,046,595	$523,297	$21	$21	
											$158	**$79**	**$1,982,314**
b. Flow @ 30,000 ac. ft./yr in 2030													
State Owned Transport System (1)							($68)	($2,047,004)	($2,047,004)		$68		
Fish & Wildlife	100%	($2)	($168,096)	100%	$2	$168,096			$0		$6	$6	
Lake Side Property Values	0%	$0	$0	100%	$4	$318,442			$318,442		$0	$0	
Agricultural & Related Income /Economic Development Income(2)	100%	$0	($1,582,724)	100%	$70	$4,882,081			$3,299,357		$53	$53	
Total			($1,750,820)			$5,368,620			$1,570,796	$785,398	$26	$26	
											$153	**$85**	**$2,536,218**
c. Flow @ 35,000 ac. ft./yr in 2050													
State Owned Transport System (1)							($61)	($2,125,769)	($2,125,769)		$61		
Fish & Wildlife	100%	($2)	($196,112)	100%	$2	$196,112			$0		$6	$6	
Lake Side Property Values	0%	$0	$0	100%	$4	$371,516			$371,516		$0	$0	
Agricultural & Related Income /Economic Development Income(2)	100%	$0	($1,846,511)	100%	$70	$5,695,761			$3,849,250		$53	$53	
Total			($2,042,623)			$6,263,390			$2,094,997	$1,047,499	$30	$30	
											$149	**$88**	**$3,090,122**

Notes:

(1) The cost of the transportation is $125 million for a pipeline with 108,000 ac. ft. capacity, allocated to the project at (35,000/108,000)X$125 million amortized at 3% real int. for 50 years = $1,574,412 per year. Pumping cost = $0.03/1000/ft.lift.

(2) The marginal use of water in the region is LCRA firm yield water at $36/ac. ft. The income value of water is the direct and indirect regional income change as a result of the transfer.

The marginal income value of water in the basin of origin is $36 times the income multiplier for the irrigated ag sector for the region.

The loss in the exporting region is a prospective one, equal to the direct plus indirect value multiplied by the probability of use occuring in the region (100%).

The probability of economic development in the future is determined by subjective methods of a panel of experts. The income value in the receiving basin is the marginal value of water available in the region, minus the price of imported water, times the income multiplier for the water and wastewater utility sector in the receiving basin.

(3) The transfer fee is calculated with and without the transport system. The fee excluding transportation is an annual amount adequate to pay for the exporting region impact, plus 50% of the aggregate net income increase of the two regions.

Appendix Table 6. Third Party Impacts and Transfer Fee: Garwood to Corpus Christi, No Income Sharing

	Exporting Basin			Importing Basin			Transport Costs				Transfer Fee (3)		
Impact/Item	Probability of Agricultural Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Probability of Economic Impact	Direct Annual Income	Direct & Indirect Annual Income	Cost/Unit Transported	Annual Cost	Net Regional Income (Both Regions)	50% of Net Regional Income	Including Transportation	Excluding Transportation	Annual Payment to Exporting Region
Garwood to Corpus Christi IBT		(dollars/ac.ft	(dollars)		(dollars/ac.ft	(dollars)	(dollars)	(dollars)	(dollars)		$/ac. ft.	$/ac. ft.	(dollars)
a. Flow @ 25,000 ac. ft./yr in 2010													
State Owned Transport System (1)							($79)	($1,968,239)	($1,968,239)		$79		
Fish & Wildlife	100%	($2)	($140,080)	100%	$2	$140,080			$0		$6	$6	
Lake Side Property Values	0%	$0	$0	100%	$4	$265,369			$265,369		$0	$0	
Agricultural & Related Income /Economic Development Income(2)	100%	$0	($1,318,937)	100%	$70	$4,068,401			$2,749,464		$53	$53	
Total			($1,459,017)			$4,473,850			$1,046,595	$0	$0	$0	
											$137	**$58**	**$1,459,017**
b. Flow @ 30,000 ac. ft./yr in 2030													
State Owned Transport System (1)							($68)	($2,047,004)	($2,047,004)		$68		
Fish & Wildlife	100%	($2)	($168,096)	100%	$2	$168,096			$0		$6	$6	
Lake Side Property Values	0%	$0	$0	100%	$4	$318,442			$318,442		$0	$0	
Agricultural & Related Income /Economic Development Income(2)	100%	$0	($1,582,724)	100%	$70	$4,882,081			$3,299,357		$53	$53	
Total			($1,750,820)			$5,368,620			$1,570,796	$0	$0	$0	
											$127	**$58**	**$1,750,820**
c. Flow @ 35,000 ac. ft./yr in 2050													
State Owned Transport System (1)							($61)	($2,125,769)	($2,125,769)		$61		
Fish & Wildlife	100%	($2)	($196,112)	100%	$2	$196,112			$0		$6	$6	
Lake Side Property Values	0%	$0	$0	100%	$4	$371,516			$371,516		$0	$0	
Agricultural & Related Income /Economic Development Income(2)	100%	$0	($1,846,511)	100%	$70	$5,695,761			$3,849,250		$53	$53	
Total			($2,042,623)			$6,263,390			$2,094,997	$0	$0	$0	
											$119	**$58**	**$2,042,623**

Notes:

(1) The cost of the transportation is $125 million for a pipeline with 108,000 ac. ft. capacity, allocated to the project at (35,000/108,000)X$125 million amortized at 3% real int. for 50 years = $1,574,412 per year. Pumping cost = $0.03/1000/ft.lift.

(2) The marginal use of water in the region is LCRA firm yield water at $36/ac. ft. The income value of water is the direct and indirect regional income change as a result of the transfer.

The marginal income value of water in the basin of origin is $36 times the income multiplier for the irrigated ag sector for the region.

The loss in the exporting region is a prospective one, equal to the direct plus indirect value multiplied by the probability of use occuring in the region (100%).

The probability of economic development in the future is determined by subjective methods of a panel of experts. The income value in the receiving basin is the marginal value of water available in the region, minus the price of imported water, times the income multiplier for the water and wastewater utility sector in the receiving basin.

(3) The transfer fee is calculated with and without the transport system. The fee excluding transportation is an annual amount adequate to pay for the exporting region impact.

Appendix E
List of Current Interbasin Transfers in Texas

Existing Interbasin Transfers in Texas

ID	Basins From	Basins To	Source of Diversion	Destination	Type of Water	Year	Amount Authorized
3782	CANADIAN	RED	Lake Meredith	Amarillo	Treated	1956	(100,000 Mu 51,200 In is auth. for use in any basin)
3782	CANADIAN	BRAZOS	Lake Meredith	Lubbock, Slayton, Plainview, Tahoka & Levelland	Raw	1956	1,920 Mu 300 Ir (contract)
3782	CANADIAN	COLORADO	Lake Meredith & Lubbock WTP	Lamesa, O'Donnell & Brownfield	Treated	1956	1,115 Mu (contract)
4881	RED	TRINITY	Moss Reservoir	Gainesville	Raw	1962	4,500 Mu
4898-4899	RED	TRINITY	Lake Texoma	Lake Lavon	Raw	1967*	2,000 Mu, 600 In
4940	RED	SULPHUR	Pat Mayse Reservoir	service area	Treated	1964	1,115 Mu
4943	RED	SULPHUR	Lake Crook	Paris	Treated	1922	12,000 Mu
4961	RED	SULPHUR	Bringle Lake	Texarkana	Raw	1928	1,900 Mu, 300 Ir
5003	RED	TRINITY	Lake Texoma	Lake Lavon	Raw	1985	77,300 Mu
5145	RED	BRAZOS	Merargel Creek Lake & (?small lakes)	Megargle & service area (?)	Raw	1962	1935 & 1953; 1,260 Mu (implied) 35 Ir
5146	RED	BRAZOS	Lakes Cooper & Olney	Olney	Raw & Effluent	1980	(sewage effluent)
5211	RED	BRAZOS	Lake Mackenzie	Floydada & Lockney	Treated	1982	2,000 Mu, 600 In
4797-A	SULPHUR	TRINITY	Cooper Lake	Lake Lavon	Raw	N	11,274 Mu 4,832 In
4798	SULPHUR	TRINITY	Cooper Lake	Lake Lavon, service area	Raw	1965	54,000 Mu
4799	SULPHUR	TRINITY	Cooper Lake	Lake Lavon, City of Irving and its service areas	Raw	1965	44,820 Mu 9,180 In
4811	SULPHUR	SABINE	Lake Sulphur Springs	Suphur Springs	Treated	1951& 1968	9,800* Mu
4836	SULPHUR	RED	Lake Wright Patman	Texarkana & customers	Treated	1981	6,500 Mu 5,000 In
4836	SULPHUR	CYPRESS	Lake Wright Patman	Atlanta	Treated	1981	4,500 Mu 4,500 In
4590-A	CYPRESS	SABINE	Lake O' the Pines	(?Brandy Branch Lake)/City of Longview	Raw	1957	18,000 In (SWEPC?) 20,000 Mu & In (Longview)
4560	CYPRESS	SABINE	Lake Cypress Springs	Winnsboro	Treated	1968	5,000 Mu
4560	CYPRESS	SULPHUR	Lake Cypress Springs	Mount Vernon WTP	Raw	1968*	5,000 Mu 16,000 Mu (loc. in both
4814	CYPRESS	SABINE	Big Cypress Bayou	Marshall	Raw	1947 & 1958	basins)
4669	SABINE	TRINITY	Lake Fork Reservoir	Dallas, Via Lake Tawakoni	Raw	1983	120,000 Mu & In
4670	SABINE	SULPHUR	Lake Tawakoni	Commerce WTP	Raw	1955*	8396 Mu
4670	SABINE	NECHES	Sabine River	Henderson	Raw	1955*	?
4670	SABINE	NECHES	Sabine River	Orange County	Raw	1955*	?
4670	SABINE	TRINITY	Lake Tawakoni	Dallas WTP or Lake Ray Hubbard	Raw	1955*	Total
4670	SABINE	TRINITY	Lake Tawakoni	Lake Terrell	Raw	1986	227,675
4670	SABINE	TRINITY	Lake Tawakoni	Wills Point	Treated	1986	Mu 400 Mu
4693	SABINE	NECHES	Village Creek	City of Van			
3254	NECHES	NECHES -TRINITY	Lake Palestine	City of Dallas	Raw	1956*	109,337 Mu 5,000 In
3256	NECHES	TRINITY	Lake Athens	Athens WTP	Raw	1955	5,477 Mu 3,023 In
4196	NECHES	NECHES -TRINITY	Neches River	Alligator Bayou	Raw		12,900 In Max
4404	NECHES	SABINE	Lake Pinkston	Center WTP	Raw	1972	3,800 Mu
4411	NECHES	NECHES -TRINITY	Neches River & Pine Island Bayou (releases from Sam Rayburn & Steinhagen)	LNVA service area within Chambers, Liberty & Jefferson Counties	Raw	1913	114,202 Mu 651,314 In 436,360 Ir (undivided within service area)
4415	NECHES	NECHES -TRINITY	Neches River	Implied service area		1915 & 1925	56,387 Mu & In (not broken down into basins)
4415	NECHES	?TRINITY	Neches River			1915 & 1925	
4415	NECHES	SABINE	Neches River	Implied service area		1915 & 1925	
4537	NECHES	SABINE					2,200 Mu & Do 40,325 Mu, In, & Do (city lies
4853	NECHES	SABINE	Lake Tyler	City of Tyler	Treated	1947	w/in both basins)
Contract 35	NECHES	TRINITY	Lake Palestine	Part Palestine	Treated		28,000 Mu?
2319	TRINITY	RED	SCS Reservoir on Elm Fork Trinity River	City of St. Jo	Treated	1957	330 Mu
2410	TRINITY	SABINE	Lake Lavon	Royse City & others	Treated	1965	100,000 Mu 4,000 Ir 4,500 Mu, 80,000 (600
3356	TRINITY	BRAZOS	Lake Weatherford	City of Weatherford	Treated	1954 & 1969	consumptive) In, 120 Ir
4261	TRINITY	western NECHES -TRINITY	Trinity River & Old River	Chambers & Liberty Counties	Raw	1913	13,400 Ir

Existing Interbasin Transfers in Texas

ID	Basins From	Basins To	Source of Diversion	Destination	Type of Water	Year	Amount Authorized
4261	TRINITY	SAN JACINTO-BRAZOS	Lakes Livingston & Wallisville	City of Houston service area	Raw	1913 & 1959	Livingston Total 458,800 In 444,000 Mu (not broken down by basin) Wallisville Total 10,000 Mu 28,000 In (not broken down by basin)
4261	TRINITY	SAN JACINTO	Lakes Livingston Wallisville	City of Houston service area	Raw	1913 & 1959	
4261	TRINITY	NECHES -TRINITY	Lakes Livingston & Wallisville	City of Houston service area	Raw	1913 & 1959	Trinity Riv 31,800 In (not broken down by basin)
4261	TRINITY	TRINITY-SAN JACINTO	Lakes Livingston & Wallisville	City of Houston service area	Raw	1913 & 1959	(out of Livingston and Wallisville)
4279	TRINITY	NECHES -TRINITY (?Trinity-San Jacinto)	Lake Anahuac, Trinity River & Trinity Bay	Chambers-Liberty Co. ND	Raw	1906, 1914, 1936, 1952,	2,147 Mu 30,000 In 800 Mi 110,000 Ir
4965	TRINITY	SAN JACINTO-BRAZOS	Lake Houston	Highlands Reservoir, industries & irrigation	Raw	1940	
4965	TRINITY	TRINITY-SAN JACINTO	Lake Houston	Galveston & Pasadena	Treated	1940	
?4965	TRINITY	SAN JACINTO		Service Area			
5097	TRINITY	NECHES	Houston County Lake	City of Grapeland	Treated	1965	3,500 Mu
5271	TRINITY	NECHES -TRINITY	Trinity River	Devers Rice Growers	Raw	1917	2,500 Ir
5271	TRINITY	SAN JACINTO, TRINITY	Trinity River	San Jacinto River Authority	Raw		56,000* Mu, Ir, In, Mi (multipurpose)
4965	SAN JACINTO		San Jacinto				
5156	BRAZOS	TRINITY	Lake Granbury	service area	Treated	1986	2,600 Mu
5167	BRAZOS	SAN JACINTO-BRAZOS	Brazos River (releases from reservoirs auth under COAs 5155-5165)	BRA service area		none	30,000 Mu, 170,000 In
5287	BRAZOS	TRINITY	Lake Mexia	City of Mexia & Mexia State School	Treated	1957	2,887 Mu 65 In
5291	BRAZOS	SAN JACINTO- BRAZOS	Teague City Lake	City of Teague	Treated	1952	605 Mu
5366	BRAZOS	SAN JACINTO-BRAZOS, BRAZOS-COLORADO	Brazos River	Brazoria County (?Fort Bend, Harris & Galveston)	Raw	1960	45,000 Mu
1002	COLORADO	BRAZOS	Lake J.B. Thomas	Part of Fisher County	Raw	1946	30,000 Mu, In, Mi (not broken down by basin)
1031	COLORADO	BRAZOS	Oak Creek Reservoir	Lake Trammell & Sweetwater	Raw	1949	5,328 Mu 4,000 In
1660	COLORADO	BRAZOS	Lake Clyde	City of Clyde	Raw	1965	200 Mu
3866	COLORADO	BRAZOS	Lake O.H. Ivie	City of Abilene & its customers	Raw		15,000 Mu
5434	COLORADO	NUECES, NUECES-SAN ANTONIO, NUECES-RIO GRANDE	Colorado River	Corpus Christi & it's service area			
5437	COLORADO	BRAZOS	Colorado River	South Texas Reservoir	Raw	1974	
5471	COLORADO	BRAZOS	Lake Austin & Town Lake	Williamson County and poss. others	Treated	None	250,000 Mu (not broken down by basin)
5472	COLORADO	ANY (BRAZOS)	Town Lake	Williamson County and poss. others		None	22,403 Mu (uncertain whether industrial can be transferred)
5475	COLORADO	COLORADO- LAVACA	Colorado River & Eagle Lake	Lakeside Irrigation	Raw	1901	
5482	COLORADO	BRAZOS	Lake Travis	Cedar Park	Treated	1901	
2095-A	LAVACA	NUECES, COLORADO-LAVACA, LAVACA-GUADALUPE, SAN ANTONIO-NUECES, NUECES-RIO GRANDE, GUADAUPE, SAN ANTONIO	Lake Texana, Lavaca River	LNRA service area, including City of Corpus Christi and its service area	Raw	1972	20,000 Mu 26,590* Mu & In (NEED ADD. PGS OF AMEND C TO VERIFY)
2074	GUADALUPE	SAN ANTONIO	Canyon Lake			1956, 1980	
3861	GUADALUPE	LAVACA-GUADALUPE	Guadalupe River	plant (located out of basin)	Raw	1948	60,000 In
3895	GUADALUPE	LAVACA-GUADALUPE	Guadalupe River	Victoria Barge Canal (discharge pt)	Raw	1978	9676 In max (can consume 4676 of the 9676 auth)
4586	GUADALUPE	LAVACA-GUADALUPE	Guadalupe River	Schwings Bayou (discharge pt)	Raw	1985	272 In max (unspecified quantity)
5012	GUADALUPE	SAN ANTONIO	Elm Bayou	irrigate 50 acres out of 149.71 acres	Raw	1985	140 Ir
5173-5178	GUADALUPE	LAVACA-GUADALUPE	Guadalupe River	Calhoun County	Raw	1941*	8,382 Ir 4,370 In & Ir 42,559 Mu, In, & Ir 940 Mu, In, Ir & Mi 10,000x Mu, In & Ir
5466	GUADALUPE	LAVACA-GUADALUPE	Guadalupe River	Victoria & its service area	Treated	1993	20,000 Mu (either basin)
2130-A	SAN ANTONIO	NUECES	Lake Medina	BMA Canals & Chacon Reservoir	Raw	1910 (Mu)	85,830 Mu, Ir, & In 750 D&L 170 Mu
5489	SAN ANTONIO	GUADALUPE	San Antonio River	Elm Creek	Raw		unquantified (floodwater for wetlands maintenance)
2464	NUECES	NUECES-RIO GRANDE	Lake Corpus Christi	Alice Terminal Reservoir	Raw	1914	
2464	NUECES	NUECES-RIO GRANDE	Nueces River	Corpus Christi Industries	Raw	1914	
2464	NUECES	NUECES-RIO GRANDE	Nueces River	South Texas Water Authority	Treated	1914	
2464	NUECES	NUECES-RIO GRANDE	Nueces River	Corpus Christi	Treated	1914	
2464	NUECES	SAN ANTONIO-NUECES	Nueces River	San Patricio MWD & Nueces County WCID #4	Treated & Raw	1914	
2464	NUECES	SAN ANTONIO-NUECES	Lake Corpus Christi	Beeville	Raw	1914	
2466	NUECES	NUECES-RIO GRANDE	Nueces River	Nueces County WCID #3	Raw	1909	
4402	NUECES	SAN ANTONIO-NUECES	Lake Corpus Christi	Taft drainage canal/	Sewage effluent		600 Irr
5509	NUECES	SAN ANTONIO-NUECES	Nueces River	Rincon Bayou	Raw	1994	unlimited
4520-4555	RIO GRANDE	NUECES-RIO GRANDE	Falcon and Amistad Reservoirs		Raw		Irr

Source: Texas Natural Resource Conservation Commission

MU = Municipal; IR = Irrigation; IN = Industry

* several priority dates associated with water right.

** Data contained herein may be incomplete ..... date of table 10-18-96

* Total amount can be used in either basin(s) or amount has multipurpose use

Appendix F
Types of Mechanisms Used to Compensate for Energy Project Impacts on Local Communities During the 1970s and 1980s: Comprehensive Set of Response Alternatives

Planning and Management Mechanisms

- Voluntary Industry Reporting
- Mandatory Industry Reporting
- State Clearinghouse / Monitoring Function
- Regional Clearinghouse / Monitoring Function
- Local / Interlocal Coordinating Committees
- Regional Impact Teams
- State Technical Assistance Function
- Circuit-Riding Planners / Administrators
- Direct Financial Assistance for Planning
- State Incentives for Intergovernmental Cooperation
- Socioeconomic Impact Assessments / Mitigation Plans - As Permit Condition
- Create Interlocal Planning and Management Authority with Limited Governmental Power
- Mandatory Industry Assistance Programs for Planning
- State Siting Law
- State Permit Program
- State or Regional Joint Permit Review Process
- Introduce Community Impact Criteria / Performance Standards into Existing State Approach (e.g., P.U.C., R.R.C.)
- County Zoning Enabling Act
- County Special Use Permits
- County Mobile Home Zoning, Performance Standards
- Clarify, Liberalize Municipal Mobile Home Zoning, Code Authorities
- Introduce Substantive Standards into County Subdivision Powers
- Enlarge ETJ and / or ETJ Powers of Small Cities
- Clarify Legislative Position on Limited Purpose Annexation

Financial Mechanisms

- State Assistance Programs - Grants Only
- State Assistance Programs - Loans Only
- Grants Eligibility
  - impact area entitlement
  - special hardship / emergency cases
- Loan Programs
  - direct credit
  - local bond guarantees
  - state purchase of local bonds (several alternative fund types)

Financial Mechanisms (Concluded)

- State-Administered Federal Assistance Programs
  - creation of special accounts
  - priorities for impact areas
  - Small Cities programs - impact applications
- State Revenue Sources
  - general appropriation
  - dedicated revenues
  - state severance tax (unit / value base)
  - severance tax prepayment
- Local Revenue Enhancement
  - amendments to property tax limits
  - tax prepayment
  - accelerated appraisal and levy for major facilities
  - additional .05-.01 local municipal option sales tax statewide
  - additional local sales tax, growth formula or regional
  - expand local bonding requirement
  - removal of tax exempt status of TMPA, LCRA
  - expanded fees and charges for services
  - new charges for hookups, tap fees
- Infrastructural Financing Alternatives
  - improve individual incentives for special district creation
  - incentives and information for other private action
  - triple net leasing
- Industry-Sponsored Assistance
  - special prepayment incentive
  - clarify, broaden PUC rules on pass through expenditures
  - tax credit program
- Interlocal Revenue Cooperative Arrangements
  - state collection and distribution
  - creation of special impact districts with bonding, other powers, supported by lignite-increment financing

APPENDIX G

TEXAS WATER DEVELOPMENT BOARD

DRAFT REPORT REVIEW COMMENTS

TWDB Contract No. **99-483-269**

"Third Party Compensation for Interbasin Transfers of Water in Texas: Alternatives for Funding and Payment"

General comments

1. Please make editorial changes to account for typographical errors, questionable syntax, improper hyphenation, word usage, and spelling errors. For example:

- *heretofore* and *nonetheless* are single words, not hyphenated expressions.
- "Well" has multiple meanings.
- "Foregone" could easily be replaced with another word to improve clarity.
- "Annul" means something entirely different than annual.
- The Aluminum Company of America is known as Alcoa, not Alcola.
- It's Medina County, not Madenia.
- For future reference, third party, when used as a noun is two words, and when used as an adjective, is hyphenated (e.g. third-party compensation, third-party impacts, etc.).

2. Some introductory explanation is needed to tell the reader why other possible values than pecuniary ones are not considered in the report. Other values might not require water use, such as wildlife habitat or the value that residents place on having that unused water available. These may not be substantial in some areas, but some areas may have very strong feelings that result in significant values. Briefly discuss the focus on measurable compensation mechanisms, in order to forestall the quality-of-life arguments as beyond the scope of this report.

3. Terms used in the report should be defined the first time they are used. For example:

- "backward" and "forward" linkages are never defined.
- The "Willitt Criteria" is mentioned on p.11, but is not actually defined until p. 41. An appendix of definitions may be helpful.

4. In the section of examples on pp. 13-18, it would be helpful to have subheaders separating out the examples. For instance, it would make sense to put the Class A examples together, the Class B ones together, and the Class C ones together respectively. More often than not, the type of example being described was not stated until the last sentence of the example. It also would have been helpful here to remind the reader of the definitions of the three classes, so that the reader does not have to flip back through the text.

5. Either a more-detailed explanation of costs should be presented in the text of the report or a more extensive use of footnoting and referencing to appendices should be provided. The present value analysis cites numerous costs without explanation.

Specific comments

6. On page i, line 5, and again in Part III, there is reference to "current conditions in Texas" that "demand" a policy of compensation be adopted. In the text of the report, supporting rationale for this assertion is sparse. Please emphasize why a compensation policy might be needed now.

7. Page 6 - The guiding rule for the approval of an interbasin transfer seems to come out of nowhere. It should have been discussed in more detail instead of referring to the book from which the rule came. Please explain why this is the "guiding rule" and include case data, if available, to indicate the success of this approach.

8. In the Executive Summary (Page vii, Expanding Role of Texas Water Bank): This section seems to better named for expanding the role of Texas Natural Resources Conservation Commission (TNRCC) in setting compensation that must be provided when IBTs are approved. While the Bank can broker IBT sales, it can not force an increased cost to the sale. If the Bank tried, buyers would simply not use the Bank. Adding the cost is a regulatory act, not an act for a broker.

9. The expansion of the role of the Water Bank, as noted on page *ix,* to include the assessment and collection of compensation for third-party impacts seems ill-advised. Since the TNRCC would be establishing this sort of information in its administrative proceedings to issue a permit or permit amendment, it would seem logical that the TNRCC would establish and collect such compensation. If the Water Bank were to do so, much of the work could be duplicative and would add an unknown additional administrative burden to the applicant. [Some discussion of TNRCC's role would improve the Water Bank suggestion].

10. As noted on page *ix,* under Section II, please clarify if this is a proposal for the Water Bank to use bond money to buy and sell water rights in addition to existing authority to use funds in the water bank account of the Water Assistance Fund or a proposal for the TWDB to issue bonds for the Water Bank.

11. Including an option to use the Regional Water Planning Groups (RWPG) to carry out a compensation program seems ill advised. There are current concerns related to the ability of the RWPG to produce the products required by statute in the mandated timeframe. It's unlikely that any proposal to add responsibilities would seriously be considered by the Legislature or be endorsed by the RWPG.

12. More explanation of the need for separate classes of compensation is needed.

13. On page xii, it seems a better example would be to assume that the 100,000 ac/ft comes from the *agricultural* sector obtaining water from the Highland Lakes. That is what the Lower Colorado River Authority (LCRA) has said would happen if they were forced to sell water to San Antonio.

14. Page xiv: One *big* impediment not mentioned is the difficulty to determine, with any degree of acceptance by the other party, the income forgone in the basin of origin or the income gained in the basin receiving the water. [it is suggested that this be emphasized in the text]

15. Page xi: Clarify if the income values are reasonable, as to the Sabine transfer. It seems impossible that Houston's growth that would need 600,000 ac-ft/yr would only generate $140M in income. Use of 600,000 ac-ft/yr is enough water for 3.6M persons, not counting industrial water use, and the $140M is income of only about $40 per person.

16. On page 30 (last paragraph), the report states that the water diverted to Houston is "surplus water" in the lower Sabine. In this case, the water would have a very low marginal value in the exporting basin, perhaps even lower than the marginal price (MVeb and MCeb in the page 7 equation). If this water were surplus, and continued to be surplus in the future, there would seem to be no M&I income forgone, only the recreation and fish and wildlife values forgone. In this case, the losses to Sabine would only be $1.1 million in 2010, rather than $5.8 million. Please make clearer the rationale for establishing the foregone income.

17. The report calculates the loss of income as if all of the water is being used. and then multiplies it by a probability of this total use happening. Somehow this doesn't seem to be the best way of estimating forgone production. Projections of industrial growth should be made and then analyze to see if the transferred amount cuts into the water need of the growth. Explain why this alternative is not a better approach and is not used in the report, noting that the scope of this research did not include developing methodologies for determining income gains or losses it was to explore mechanisms of compensation.

18. Even if water were constrained in a region and some industrial development was lost, other industrial production would not necessarily be lost. The growth of high-income, low-water-use industries in the area may allow no income loss, even in a water- constrained situation.

Comments from Legal

19. Executive Summary- Para. 1, line 4: Texas doesn't reserve water for basin of origin, *per se.* [rephrase]

20. Executive Summary- p.vii, bullet 2: (regarding lakeside property owners) This should not require compensation. Lakes built for water supply would have lower levels if water were used in-basin or out of the basin. [Rethink devalued property]

21. Page 3, Para. 2 should read: "...permit issued by the TNRCC to specify the-[any] *change[strike out to]* from a current permit." And line 4: "(not much of which currently

exists [without impoundment])". And para. 4: ~ [Chapter] 290.

22. Page 6, Para 2, line 5 should read: "The [third] parties to be compensated .... "

23. (typo p. 7, line 3 should be "itself')

24. Page 10. TNRCC imposes flow conditions that prevent loss of fish and wildlife.

25. Para. 3: TWDB can only use bonds to provide financial assistance to political subdivisions for construction of projects, which can include water rights purchases. There is not bond authority to merely fund the Water Bank. [Rewrite to suggest this would require legislative authority] *Note: SB991 was passed in the 76th Leg. and signed by the governor. It gives more authority to 7'WDB to own water that can betransferred. Some reference to the effect of this bill might be useful*

26. Page 16, full para. 3: The transactional costs and uncertainties of assessing these matters are potentially high in a contested case. An established methodology could be very beneficial.

27. Page 19, para. 3: Yes, this is advisable.

28. Para. 6: Please define what "backward and forward" linked businesses are. Also, same comment regarding lakeside properties as above.

29. Page 21, para. 3: Legislation is needed to acid the capability for assessing and making third party impact payments.

30. Page 22. Last para (a.): TWDB already can do this element. In footnote:"Art. 717p authorizes river basin-,, [authorities] .... "

31. Page 23: under b. TWDB can do this now.

32. Under c. Need legislative change.

33. Under A. Legislation needed for some or all.

34. Page 24: middle page: SB1 does not appear to provide such wide powers. [The Contractor needs to check with Legal about the effect of SB1030.]

35. Under II. a, TWDB can buy and sell, but will need authority to add fees.

36. Page 30, para 4: Good analysis.

37. Last para. The priority date could be important if the water already is permitted and if rights issued after the existing right would reduce the yield available for IBT.

38. Page 37: Under (1) Please clarify if this based on fish and wildlife loss after TNRCC imposed permit conditions.

39. Page 38, under (2) New authority must be given to TWDB unless a political subdivision finances and the projects meet statutory tests.

40. Summary: Para. 1 Texas has never reserved water for one basin. Basin-of-origin protection in Texas prior to SB1 was very weak.

RESOURCE ECONOMICS, INC., RESPONSE TO TEXAS WATER DEVELOPMENT BOARD COMMENTS

General Comments

1. Completed as suggested.

2. Completed as suggested.

3. Completed as suggested.

4. Completed as suggested.

5. Explanations added to text and Appendix C.

Specific Comments

6. Revised language and explained why change is needed.

7. Completed as suggested.

8. Author does not agree that expanding Role of Texas Water Bank would be better named for expanding the role of TNRCC. TNRCC has to judge the appropriateness of proposed compensation as a regulator for jurisdictional cases, and therefore should not be in business estimating and negotiating such. Further, program management of payments for the various forms of compensation are better done by a non-regulatory body. Further, the Bank would not have to "force" an increased cost to the sale if state law required a tax or fee on the sale. The legislation would declare how the tax is imposed.

9. Same response as #8.

10. Completed as suggested.

11. Author agrees that RWPGs would be a poor choice, but building such a capacity in these groups would constantly give them more substance as planning groups.

12. Completed as suggested.

13. The third example focused on agricultural sector impacts. The author wanted a case of a firm, water sale to San Antonio. Relative to the alternative of M & I use in the future in the Lower Colorado basin, the impacts on agriculture would tend to "wash out".

14. Language added as suggested. The paper suggests a negotiating role for the administrative agency for the reason the reader suggests.

15. This comment and comment 18 point out the problem of the need for developing credible information concerning the contribution of water to economic growth. The author believes the evidence shows the truth to be closer to comment 18 rather than 15, but the matter deserves careful work to produce accurate estimates. The income value of water is the measure used here that defines the maximum that the importing basin should rationally pay for the water itself, separate from the payment for transportation, treatment and distribution. Payment for imported water, or structures to impound water, come either from the income flow of the region, or from savings, loans or assets sold, all of which translate into an income flow that is given up in exchange for the water project. Further, the income value in the example is measured at its location in Toledo Bend, before transportation, treatment, and distribution costs are added. Such a consistent measuring point is needed to be able to sum economic values from various uses (such as recreation, industrial, residential and steam generation, all of which are used at different locations, with different treatment, distribution, and transportation costs) to get an estimate of total value of water. The price of water used in this example, delivered to an industrial consumer in Houston is $282 per acre foot. More detail, supported by credible applied economics research is added in Appendix C.

16. Author agrees that the probability of development in the Sabine is quite low, probably lower than the 10% estimate used in the example. The net results of the example would not change materially if the percentage was lowered.

17. Projections over 50 years without some subjective probabilities, or sensitivity method is not very useful. A thorough analysis would include both.

18. See 16.

Comments from Legal___

19. Author is aware that Texas doesn't reserve water for basin of origin. Corrected language that implied that Texas does so reserve water.

20. Lake side property owners' property values are related to the lake levels maintained by the lake operator. Lake levels are necessarily variable as withdrawals are made to satisfy firm water right holders and for downstream releases for maintaining minimum stream flows and to satisfy interruptible demands for irrigation. If a transfer of firm water out of basin increases the variability of the lake levels due to the loss of return flows, relative to that which would occur from a firm sale in-basin, then lakeside property may be impacted. Language changes made to clarify this point.

21. Changed as suggested.

22. Changed as suggested.

23. Changed as suggested.

24. The Texas Parks and Wildlife Department is required under state law to restrict a proposed diversion by imposing minimum stream flow requirements to protect fish and wildlife. Such requirements in practice are designed to prevent such losses to the maximum extent possible, but if some impacts occur to require mitigation. Implementation of the law does not mean that absolutely no impacts on fish and wildlife will occur.

25. Changed as suggested.

26. Added language responsive to the comment.

27. No response needed.

28. Changed as suggested. See response to comment 20. regarding lakeside property.

29. This section is intended to discuss the agencies/programs most likely to administer the programs and manage the money from a tax or fee. Legislative requirements are discussed in the section on Alternative Mechanisms.

30. Changed as suggested.

31. Changed as suggested.

32. Changed as suggested. See response to comment 29.

33. Changed as suggested. See response to comment 29.

34. Added language responsive to the comment.

35. Changed as suggested. See response to comment 29.

36. No response needed.

37. Added footnote to this effect.

38. Added footnote to this effect

39. Changed as suggested.

40. Author is aware that Texas has never reserved water for one basin. Corrected language that implied that Texas does so reserve water.