STORM DRAINAGE STUDY AND MASTER PLAN

FOR

CITY OF NEW MEADOWS

SEPTEMBER 1991

Prepared By:

J-U-B ENGINEERS, Inc.
Engineers Surveyors Planners
250 South Beechwood Avenue
Boise, Idaho 83709

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PROFESSIONAL ENGINEER
REGISTERED
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9/9/91
STATE OF IDAHO
PHILLIP H. KRICHBAUM

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CITY OF NEW MEADOWS

STORM DRAINAGE STUDY AND STREET MASTER PLAN

I. INTRODUCTION

A. Project Setting

The City of New Meadows is located in west central Idaho at the intersection of U.S. Highway 95 and State Highway 55. The community lies in the southern portion of Meadows Valley at the headwaters of the Little Salmon River. The Meadows Valley is bordered to the east by the Salmon River Mountains, and to the west by the West Central and Seven Devils Mountain ranges, both which occur primarily in the Payette National Forest. Approximately 600 people reside in this "rural" set community.

B. Climatology

The mean annual temperature and mean annual precipitation as recorded by the Payette National Forest Ranger Station, which is located in New Meadows, are approximately 42°F and 26 inches, respectively. Annual snowfall in the area can be over 90 inches in accumulated depth.

C. Topography

The topography of New Meadows can be categorized as being situated in a broad valley floor. The valley floor is relatively flat, with a mild groundline slope to the northwest. Groundline elevations throughout the townsite vary from approximately 3872 (MSL) in the southeastern portion of the City to 3859 in the northwestern corner of town. Grouse Creek lies east of the City and flows northwesterly to the Little Salmon River. Little and Big Creeks are also tributaries of the Little Salmon River and are located southwest of the townsite. The Little Salmon River lies west of town and has a northerly gradient through the Meadows Valley.

D. Geology

General geological classification of the site can be categorized as alluvial deposits comprised of fine grained clay and silt loams, which range in depth from two to three feet below groundline. Sandy silts typically occur at greater depths.

II. SCOPE AND OBJECTIVES OF MASTER PLAN

A. Need for Improvements

The City of New Meadows has been plagued with storm runoff flooding at an almost annual occurrence. Typically, the most serious flooding occurs during the early spring, when warm southerly storm tracks bring heavy rains onto the snow covered region. This combination of rain on snowfall appears to bring the most severe flooding to the City. The existing storm drainage facilities, which are comprised mostly of roadway ditches and culverts, do not have adequate capacity to convey these high runoff flows; consequently, surcharging and ponding occurs. Several factors besides inadequately-sized storm drainage facilities contribute to the problem.

1. Capacity of the culverts is reduced due to clogging and siltation.

2. Topography of the townsite contributes to the flooding potential. The land area slope does not generally provide enough gradient for positive drainage.

3. The fine grained soils present on the site are not freedraining, which results in higher storm runoff flows.

4. The street system layout does not provide adequate conveyance of surface drainage from adjacent land areas. Street travelway surface is typically raised above the adjoining land areas, and street grades are too mild for longitudinal conveyance of storm runoff flows in the roadway ditches.

B. Authorization

J-U-B ENGINEERS, Inc., received authorization by the New Meadows City Council to perform a Storm Drainage Master Plan Study along with street improvement layout in 1990.

C. Master Plan Study Objectives

1. Develop working hydrologic computer model of City to predict on-site storm runoff flows.

2. Develop alternative conceptual storm drainage facility systems.

3. Select ultimate drainage facilities plan and prepare master plan drawings from City-provided aerial topographic mapping. These master plan drawings are for the purpose of depicting line sizes and a general preliminary layout for the drainage facilities.

4. Analyze street system and revise centerline street grade lines for incorporation into the ultimate drainage plan. Prepare preliminary layout plan and profile street drawings. A complete street system redesign in accordance with AASHTO, Geometric Standards, was out of the scope for this Master Plan.

III. DESIGN CRITERIA

A. Street Layout

The City street network was analyzed with respect to the following criteria:

1. Finished profile grades of streets were set at a minimum of 0.50% in order to provide adequate conveyance of overland storm flows within the roadway ditches. Short reaches of grades lesser than 0.50% can be tolerated but, overall, 0.50% is a recommended standard of practice for gradient in gravel lined street ditches. Several streets required intermediate "rolled" grade breaks to meet the minimum grade criteria.

2. Finished grade profiles were set to minimize "cuts" and "fills" on the existing street gradeline and adjoining properties.

3. A typical roadway section was developed utilizing geotextile fabric within the ballast section (see Figure 2 for Typical Section). The section was developed from J-U-B's "Street Plan" which was prepared for the City in September 1987.

B. Hydrology

1. Design Storm

The rainfall storm frequency, which was selected for analysis and design, was 10 years. This storm is the largest storm, in terms of total precipitation, which is statistically predicted to occur over a 10-year period or has a 10% chance of occurring each year. A 10-year design storm appears to provide a balance between storm drain facility costs and adequate flood protection. Storm drainage facilities which are designed for a 50-year storm, would likely be much more costly than a system which handles a less intense 10-year storm. Some limited and occasional flooding should be tolerated when less frequent more intense storms occur other than the 10-year event. Damage from such less frequent events should be reduced by the in-place storm drain facilities handling the 10-year storm. A 24-hour storm duration was used and was distributed in accordance to the U.S. Department of Agriculture, Soil Conservation Service (SCS), synthetic rainfall distribution Type II. Type II is the most intense storm which occurs in this geographic region. The point precipitation value for the design storm selected was 2.40 inches, which was taken from the National Oceanic and Atmospheric Administration (NOAA) Atlas 2, Precipitation - Frequency Atlas of the Western United States, Volume V - Idaho, U.S. Department of Commerce, National Weather Service.

No depth-area reduction in the point precipitation value was allowed since the contributing drainage area is small and, therefore, it is more likely that 2.40 inches of rain will fall uniformly over the entire, contributing drainage area.

2. Study Area Limits and Assumptions

a. On-site Conditions

Figures 1 and 3 show the study area limits for the Storm Drainage Master Plan. The study area consisted mostly of the existing townsite. These limits were set primarily from the available aerial topographic mapping which was provided by the City. Urban growth outside this study area may occur, but was considered as non-contributing in terms of the storm runoff flows. Assumptions pertaining to the off-site areas and ultimate land utilization are discussed in further detail per the following section. It is important that developments, which may occur outside of the study area, be fully evaluated for their potential storm runoff impacts to the storm drainage system. Norris Avenue sets the east study area border while Commercial Street forms the western limit. Wiley and McLain Streets are respectively the south and north delineations.

b. Off-site Conditions

The following assumptions were taken:

- Land areas south of Wiley Street were not considered as contributing to the on-site storm runoff flows. Along the southern right-of-way of Wiley Street, there exists a drainage ditch which appears to intercept storm runoff flows from the south, and conveys these flows to the west. These flows are discharged into tributaries of Little Creek and do not enter the on-site storm patterns. The irrigation ditch then forms a line of drainage delineation from southern land areas. Storm runoff from future developments may be conveyed by this drainage ditch without entering the City storm drain system.

- Land areas north of McLain Street were assumed off-site. Highway 95, which runs north to the City of Riggins, delineates storm runoff flows from land aras northeast of study area. Storm runoff flows from these land areas are also intercepted by the West Branch of Goose Creek. West of Highway 95, and north of Mclain Street, lies a bench area where the New Meadows Airport is located. Storm runoff flows should partially be intercepted by the ditch that is located east of Cunningham Avenue and travels northwesterly past Mclain Street. The prevailing drainage pattern of the remaining land areas north of Mclain Street is westerly towards the Little Salmon River.

- As shown on Figure 3, the westerly lots adjoining Commercial Street, set the westerly delineation line for the study area. Topography west of this line provides westerly drainage towards the Little Salmon River and, therefore, can be classified as off-site.

- There exists the possibility of contributing storm runoff flows entering the study area which are generated from the large cultivated land areas to the east of Norris Avenue and south of State Highway 55. Past observations show the majority of these runoff flows enter the "on-site" study area at the intersection of Katherine Avenue and Norris Avenue. A system of culverts and ditches along Katherine Avenue convey these flows westerly through town. Previous improvements have been made to divert these overland flows to minimize their impact on the City's existing drainage facilities. The improvements included construction of diversion berms within the large cultivated field immediately east of Norris Avenue and south of State Highway 55. One berm was constructed to capture runoff flows on the eastern one-half of the field. The berm provides conveyance to the north where the flows are piped under Highway 55 and subsequently discharged to an open channel. The other berm was constructed east of the Wiley Street and Norris Avenue intersection. This berm was constructed to divert some of the field runoff flows to the Wiley Street ditch. Both of the diversion berms have a limited effectiveness on preventing storm runoff flows from entering the City at Katherine Avenue and Norris Avenue intersection.

To account for the off-site storm runoff flows which are generated from the land areas east of Norris Avenue and south of Highway 55, past site observations were used in lieu of hydrological modeling. Key City personnel, who were familiar with the magnitude of these runoff flows from past storm events, provided a means of estimating these flows. It was assumed that these runoff flows were equal to an eighteen inch (18 inch) culvert capacity at full flow conditions which is approximately 5 cfs. Runoff flow may exceed the assumed value if adequate off-site improvements are not rigorously implemented, such as the rehabilitation of the diversion berms; construction of new interceptor drains and culverts, and modification of irrigation practices. These improvements will help minimize the introduction of off-site runoff flows into the City storm drain system. It is unfeasible, in terms of economical storm drain sizing, to set this entire land area (east of Norris Avenue and south of Highway 55) as contributing watershed to the on-site runoff flows. The impact of such large flows would yield an overly conservative storm drain sizing.

3. Ultimate Land Development

The study area ("on-site") as shown on Figure 3 was considered as fully residentially developed. Land areas outside of the study area were considered essentially "off-site" and, therefore, not contributory to the storm drain system. Development, then, of these off-site land areas and subsequent ultimate storm runoff flows should not be introduced into the on-site runoff flows, unless the developments modify the existing physiographic features and prevailing drainage patterns. It is important that developments occurring both within and outside of the study area be evaluated to determine if its drainage is consistent with the assumptions made in this study.

4. Irrigation Drainage

A full investigation of irrigation water flows and corresponding rights within the study area was out of the scope of services for this study. Irrigation water conveyance systems and storm water collection systems should typically be kept separate from each other.

Nuisance irrigation water runoff from residential lawns or agricultural areas were not considered to act concurrently with storm runoff flows. The likelihood of the 10-year design storm occurring at peak irrigation water runoff seems remote.

C. Environmental Aspects

The purpose of this section is to provide a brief overview of environmental concerns which may affect the project. New regulations which address the water quality aspects of storm water runoff discharges are being implemented by the EPA, through Section 402 of the Clean Water Act; however, it appears that these regulations will not place restrictions on this project.

The U.S. Fish and Wildlife Service and Idaho Department of Fish and Game Agencies will need to be consulted to ensure that no endangered species are affected by storm water runoff discharges into the Little Salmon River. If Federal funds are used to finance the project, the funding agencies will require documentation that no federally listed endangered species will be adversely affected by the project. To meet these requirements, a biological survey/assessment may be required under Section 7 of the Endangered Species Act. These procedures are usually very straight forward, but may become involved if the Little Salmon River near the outfall point is considered an anadromous fish holding waterway, and if the anadromous fish (i.e., salmon), become listed as a threatened species. The National Marine Fisheries Service would likely become involved in the project and may require additional conditions.

The U.S. Army Corps of Engineers may have jurisdiction over drain ditches that would be encroached by the storm drain truckline alignment. Subsequently, permits may need to be secured.

IV. HYDROLOGICAL MODELING

A. Modeling Method

Storm runoff flows for the study area were determined using software developed by Pizer Inc. "Hydra-Storm and Sanitary Sewer Analysis Software," Version 4.0. The storm runoff analysis method selected was the Soil Conservation Service (SCS) method which incorporated some modifications by the Santa Barbara method. This method generates storm runoff hydrographs given design storm and drainage subbasin characteristics such as percentage of impervious areas, soils, ground cover, land slope, and hydraulic length. The program has the ability to combine individual subbasin hydrographs; thus, forming composite hydrographs. Hydrographs can be routed in open channels and gutters or collected via catch basins and routed through subterrain conduits.

The SCS TR-55 Method "Urban Hydrology for Small Watersheds" program and hand calculations using the Rational Method were used to check storm runoff flows that were generated from the Hydra model.

B. Subbasin Delineation

Subbasins were determined for each catch basin in the storm drain system. A subbasin can be defined as a land area which uniquely contributes only its storm runoff flow to a single point of outlet. Aerial topographic maps, which were supplied by the City, were used for defining the subbasins and determining subbasin acreage. The limits of the subbasins were determined by the existing topography (i.e., prevailing land drainage patterns) and proposed drainage orientation of street grades. Some field investigations and interviews with key local personnel helped refine the subbasin delineation. The entire study area encompasses some 110 acres which was broken down into 75 subbasins varying in size from 0.5 to 5.5 acres.

C. Hydrological Soil Grouping

The SCS field office, which is located in Weiser, Idaho, was contacted in order to obtain soils information in the area. The SCS provided soil maps, hydrological soil grouping, and soil descriptions from their draft "Soil Survey of Adams and Washington Counties, Idaho." There are four hydrological soil groups (HSG) which occur in the immediate vicinity of New Meadows. These soil groups are classified in accordance to the minimum "bare soil" infiltration rates ("A" being the highest infiltration rate, lowest runoff potential). HSG "D" soils dominate over other soil types in the study area. Some HSG "B" soils occur over the northwestern corner of the town; however, their impact was assumed to be negligible; therefore, the entire study area was conservatively assumed to be of HSG "D." The HSG "D" soils consist mostly of clay and silt loams and in conjunction with saturation from high groundwater, have a high potential for runoff. Urbanization has less of an effect on storm runoff with HSG "D" soils than with other groupings. Because of the low infiltration rates of HSG "D" soils, the effect of increased urbanized impervious areas is less dramatic.

D. Curve Number Determination

An important subbasin characteristic and parameter used in the SCS method is the curve number. The curve number is a function of soil type, ground cover, antecedent moisture condition, and land use. Even though impervious areas exist, urban area soil types remain an important parameter for determining storm runoff. Hydrological soil type determination was described in the previous section. Ground cover also in conjunction with soil type, influence runoff from land areas. Urban grass lawn areas were considered as being in good condition.

Urban land use significantly affects the subbasin's storm runoff potential by creating impervious areas such as house rooftops, driveways, sidewalks, parking lots, and streets. Surface storage "ponding" and soil infiltration of rainfall are reduced by these impervious areas thereby increasing the subbasin's peak storm water runoff flow and volume of storm water runoff. Antecedent Moisture Condition II was selected for the study. This parameter takes into account soil moisture prior to the design storm rainfall. Condition II is described as an average condition, where as Condition I is very dry soil, and Condition III is soil which is close to saturation.

The above parameters yielded a composite curve number of 85 using SCS TR-55 methods.

E. Time of Concentration

Time of concentration can be defined as the time required for storm runoff to travel from the most hydraulically remote point to subbasin outlet. Times of concentrations were calculated as outlined in SCS TR-55 and NEH-4 and also in accordance with the Idaho Transportation Department methods. Flow path lengths and slopes from the most hydraulically remote point to the subbasin outlet (catch basin) were determined from the aerial topographic maps. Generally, the time of concentration flow paths were divided into reaches of different hydraulic classifications. In upper reach, storm water was assumed to occur as overland sheet flow, followed by reaches of shallow concentrated flow or open channel flow in roadway ditches. Storm runoff, hydrograph shape and correspondingly peak runoff flow and runoff volume are largely impacted by the time of concentration; therefore, a degree of care must be used in estimating this parameter.

F. Storm Drain Design Criteria/Assumptions

The following describes the storm drain design criteria and assumptions which were incorporated in the computer modeling.

1. Minimum pipe slopes per Great Lakes-Upper Mississippi River Board, "Ten States Standards" were held to provide a minimum scouring velocity of 2 fps. This velocity will minimize settling of solids in the conduits.

2. Pipes were sized for peak flow conditions at a maximum partially flowing depth ratio of d/D = 0.89.

3. Minimum pipe diameter considered was 12 inches.

4. Mannings pipe friction factor selected was 0.013 for conduits and 0.035 for gravel-lined roadway ditches.

5. Minimum pipe cover was set at two (2) feet.

6. At manholes, no minimum drop between inlet pipe invert to outlet pipe invert was selected.

7. Storm flows were allowed to be conveyed overland by the typical street ditch, until the ditch reached bank full condition. Flows were then collected by grate inlet/catch basins and then routed to the storm drain system. Catch basin inlet capacity was assumed equal to 2 cfs.

8. No existing storm drainage facilities were utilized in the modeling.

9. Outfall ditch elevations at Katherine, Benedict, and Taylor Streets were field verified. Due to the limited groundline

slope, some outfall pipe invert elevations were set at the flowline elevation of the outfall ditches. Surcharging could develop in the storm drain pipe at outfall ditch highwater conditions. Limited surcharging can be tolerated if catch basins are not backflowed.

10. Considerations were given to minimize alignment problems with existing utilities; however, a thorough underground utility investigation was out of the scope of services for the Master Plan Study.

G. Modeling Results

The modeling results lead to three alternative storm drain layouts, which are described below:

1. Alternative #1

This alternative consists of five main storm drain laterals along Wiley, Benedict, Katherine, Nora, Colt, and McLain Streets. The Wiley Street lateral was sized to match the existing facility sizing, since little on-site storm flows contribute to this line.

The Benedict Street lateral's service area is bounded to the south by Wiley Street and the north by Cedric Street. West right-of-way line of Norris Avenue sets the eastern border while the lots fronting Commercial Street to the west, form the western service area boundary. The Benedict lateral outfalls to the existing ditch west of Commercial Street. For the storm drain to "daylight" at the outfall ditch, an inverted siphon would be required to avoid the existing sanitary sewer along Commercial Street. The inverted siphon would allow the storm drain to pass below the sewer and then surcharge up to the outfall ditch.

The Katherine Street lateral's service area is approximately bounded to the north and south by Virginia Avenue and Cedric Streets, respectively. Land areas adjacent to Norris Avenue set the eastern border while the lots fronting Commercial Street to the west, form the western boundary. This lateral outfalls in the same manner as the Benedict lateral at the ditch west of Commercial Street.

Nora Street Lateral's service area is bounded to the south by Virginia Avenue. The south one-half of Blocks 41-45, set the northern limit. U.S. Highway 95 and Commercial Street form respectively the east and west boundaries. Storm runoff flows in this area are collected by the Nora Street storm drain lateral and conveyed westerly to a trunk line along Commercial Street, which routes flows northward toward the intersection with Colt Street.

The Colt Street Lateral collects storm runoff flows from a service area which is bounded to the east and west by U.S. Highway 95 and Commercial Street, respectively. The north one-half of Blocks 41-45 set the southern service area limit, while Taylor Street is the northern boundary. Storm runoff flows are conveyed to the west into the Commercial Street trunk line.

The last lateral is the McLain Street lateral. The respective service area is bounded by McLain and Taylor Streets, respectively, to the north and south. Cunningham Avenue and Commercial Street comprise the respective east and west boundaries. This storm drain collects and conveys storm runoff flows into the Commercial Street trunk line at Taylor Street intersection.

At the intersection of Taylor and Commercial Streets, the Commercial Street trunkline discharges into the large drain ditch which flows adjacent to the City's wastewater treatment plant and, eventually, into the Little Salmon River.

2. Alternative #2

This alternative is very similar to Alternative #1, except that the Commercial Street trunk line is extended southerly to collect Benedict and Katherine laterals. Outfalls are to ditches at Wiley and Taylor Streets only. No inverted siphons are required for the Benedict and Katherine laterals, since the Commercial Street trunk line is below the sanitary sewer.

3. Alternative #3

This alternative is very similar to Alternative #2 except that the trunk line is not routed along Commercial Street but is aligned 160 feet to the west along the abandoned rail line. This trunk line alignment will avoid the congested utility corridor along Commercial Street.

4. Alternative Summary

Alternatives #2 and #3 offer some advantages by lessening the number of discharge-outfall points. By reducing the outfall locations, fewer ditches will require maintenance. However, Alternative #1 will be somewhat more cost effective. Alternative #1 minimizes the conveyance of storm flows through the City by providing outfalls at "earlier" intervals in the storm drain system. Alternative #1 storm drains at Katherine Avenue and Benedict Street will need to pass through an inverted siphon for clearance under the 8" sanitary sewer at Commercial Street. The inverted siphons can create additional maintenance. Some surcharging could develop in the laterals of all alternatives because the outfall invert elevations are set near or at the ditch flowline elevations. The site's topographic relief is very mild and prevents the outfall invert elevations from being raised. During highwater conditions in the ditches, it appears that surcharging will occur; however, the catch basins should not be overflowed.

V. FUNDING ALTERNATIVES

A. Funding Alternatives

There exists four funding mechanisms applicable to storm drain system projects. Descriptions of these sources are provided below.

1. Idaho Community Development Block Grants - Department of Housing and Urban Development

   Annually, Idaho receives $6-7 million for funding eligible CDBG activities. Cities and counties may apply to the State for funds to improve infrastructure. There is a maximum of $400,000 grant per public facility project and preapplications must be submitted by November 1. The local entity must provide approximately 50-60% of the project cost in local cash match through Local Improvement Districts, Business Improvement Districts, bond issues, etc.; and, the project must meet one of HUD's National Objectives: elimination of slum and blight; project benefit to predominately (51%) low/moderate income people; or solving an imminent threat.

   The Grant can be written by an Idaho Certified Grants Administrator. J-U-B has the capability of performing this function. Grant funds can be used for Administration, Engineering Architectural fees, Construction and Inspection fees.

2. Farmers Home Administration - Department of Agriculture

   The Farmers Home Administration is authorized to provide financial assistance for water and waste disposal facilities, in rural areas and towns of up to 10,000 people, although priority will be given to areas smaller than 5,500 people. Grants or loans are available depending upon family income. (Since New Meadows 1980 median household income is $17,375.00, and $14,700 is the maximum income guideline used by Farmers Home, the town would qualify for a loan only - currently 6-7/8%). Applications may be made at any time for the 40-year loans and the bonds will be purchased by Farmers Home. These loan funds can be used to provide the required local cash match for CDBG applications.

   Farmers Home loan funds are also available for community facilities including streets.

3. Local Improvement Districts

Communities in Idaho have the power to create local improvement districts (LIDs). LIDs are formed in order to construct and finance an Infrastructure project that benefits a particular area. An LID is formed by a local government and the improvements are paid for by the proceeds from the sale of bonds. Bonds are repaid over a long period of time through special assessments levied on the property within the LID. The bonds sold to finance the improvements can be sold as tax-exempt, so the cost to the property owners is generally less than private financing. LIDs are not typically used in City-wide storm drainage facilities, since the assessment procedure, which may be based on the property's impervious area, is difficult and controversial to determine. They are used extensively, however, for street improvement projects.

4. General Obligation Bonds

The traditional means of financing most large non-revenue producing capital improvements has been through the use of general obligation (G.O.) bonds. Entities may borrow money or issue G.O. bonds totaling up to a certain percent of the taxable value of the property in the community. An election must be held and the question must pass by 66-2/3% majority vote of the qualified electors voting on the issue. Entities with existing bonded indebtedness can often issue additional debt and can coordinate existing bond maturity schedules to match newly issued bond maturity schedules.

B. Summary

A creative approach will be required to utilize a combination of the above funding sources. A CDBG could be pursued with an FHA loan being utilized as the local match. Revenue potential will have to be investigated to determine the feasibility generating local matching funds. Phasing the project would reduce somewhat the revenue burden.

VI. RECOMMENDATIONS

A. It is recommended that Storm Drain Master Plan Alternative #3 be adopted as shown on the 1" = 100' scale preliminary layout plans. This alternative will minimize alignment problems, with existing utilities routed in Commercial Street greatly simplifying the trunk line construction. Alternative #3 incorporates only one outfall point, which is the large drain immediately south of the City's wastewater treatment plant. Maintenance efforts can be focused on this drain ditch only, instead of several. The drain ditch also lies within the public right-of-way, thereby enhancing its maintenance. Opinion of probable construction costs for the storm drainage system are listed in Table 1.

B. It is recommended that the City adopt the conceptual street drainage plan which is incorporated in the preliminary layout plans. The street grades shown on the preliminary layout should supplement the overall "Street Plan" prepared by J-U-B ENGINEERS, Inc., for the City of New Meadows in September of 1987.

C. The City should develop a plan for a time phased construction of these drainage improvements. The main trunk line is expected to be constructed first, followed by phased construction of the laterals. The City may elect to perform portions of the work with City forces. Nonetheless, whether the construction is performed by City work forces or let out to bid, detailed construction plans and specifications should be developed, along with a full field survey.

D. A continuation of maintenance efforts for both the existing and proposed storm drainage improvements cannot be over-emphasized. Optimal performance of the storm drain system cannot be achieved by clogged catch basin inlets, culverts, obstructed roadway ditches, and debris ridden storm drains. A rigorously implemented maintenance program will reduce the risk of flooding and subsequent property damages.

Generally, the maintenance program should entail keeping the catch basin grated inlets free of leaves, branches, trash, snow, and ice; cleaning sediments and other deposited material from catch basin bottoms; and checking that the grated inlets are secure and placed properly, to prevent safety hazards. Roadway ditches and outfall channels should be inspected regularly for obstructions. Culverts and storm drain pipes should be inspected and kept clean of deleterious materials.

E. The City needs to implement a program to minimize the introduction of off-site storm water runoff and irrigation flows into the City storm drain system. Most notably is the large land area east of Norris Avenue and south of Highway 55. A combination of storm runoff and irrigation wastewater converge at Katherine Avenue and Norris Avenue, and typically causes flooding of this area. Several berms have been constructed in the field are east and adjacent to Norris Avenue to divert these flows from entering the City. These berms have a limited effectiveness. There appears to be several approaches to solving this problem:

1. The City can improve the construction of these diversion berms and regularly maintain them to reduce flows at the intersection of Katherine and Norris Avenues. This will require close coordination with affected property owners on the diversion berm construction. The City should also meet with the property owners to discuss irrigation practices and measures to reduce irrigation wastewater introduction into the City. County roads and roadways southeast of the City could possibly be improved to divert waste irrigation water flows and stormwater flow away from the City. Coordination with the State Department of Transportation would be required since some diverted flows may be routed into the culvert which crosses Highway 55 east of the Payette Forest Service Ranger Station.

2. If the off-site irrigation wastewater or storm runoff cannot be adequately diverted from the Katherine Avenue and Norris Avenue intersection, a diversion structure will be required. This structure will divert flows in excess of 5 cfs, to the existing open ditch along Katherine Avenue. The Katherine roadway drainage ditch and existing open ditch will need to be separated. Flows under 5 cfs can be introduced into the storm drain system.

F. New developments both within the Master Plan Study area and off-site need to be fully evaluated by the City in terms of their impacts to the storm drain system and whether these impacts can be accommodated. The City may elect to pursue City ordinances on large developments, which stipulate that post development runoff flows exceeding pre-existing flows are to be managed on-site, such as through the use of retention basins.

TABLE 1

STORM DRAINAGE FACILITIES MASTER PLAN

OPINION OF PROBABLE CONSTRUCTION COST

ITEM	QUANT.	UNIT	UNIT COST	COST
STORM DRAIN PIPE				
12"	4125	L.F.	$20.00	$82,500
15"	2170	L.F.	$21.00	$45,570
18"	1060	L.F.	$26.00	$27,560
21"	2470	L.F.	$31.00	$76,570
24"	1120	L.F.	$33.00	$36,960
27"	640	L.F.	$45.50	$29,120
30"	815	L.F.	$65.00	$52,975
36"	1780	L.F.	$68.00	$121,040
42"	690	L.F.	$110.00	$75,900
54"	640	L.F.	$140.00	$89,600
MANHOLES	43	EA.	$1,000.00	$43,000
CATCH BASINS	98	EA.	$400.00	$39,200
HIGHWAY CROSSING	1	L.S.	$7,800.00	$7,800
TOTAL				$727,795
30 % CONTINGENCY				$218,339
TOTAL COST				**$946,134**

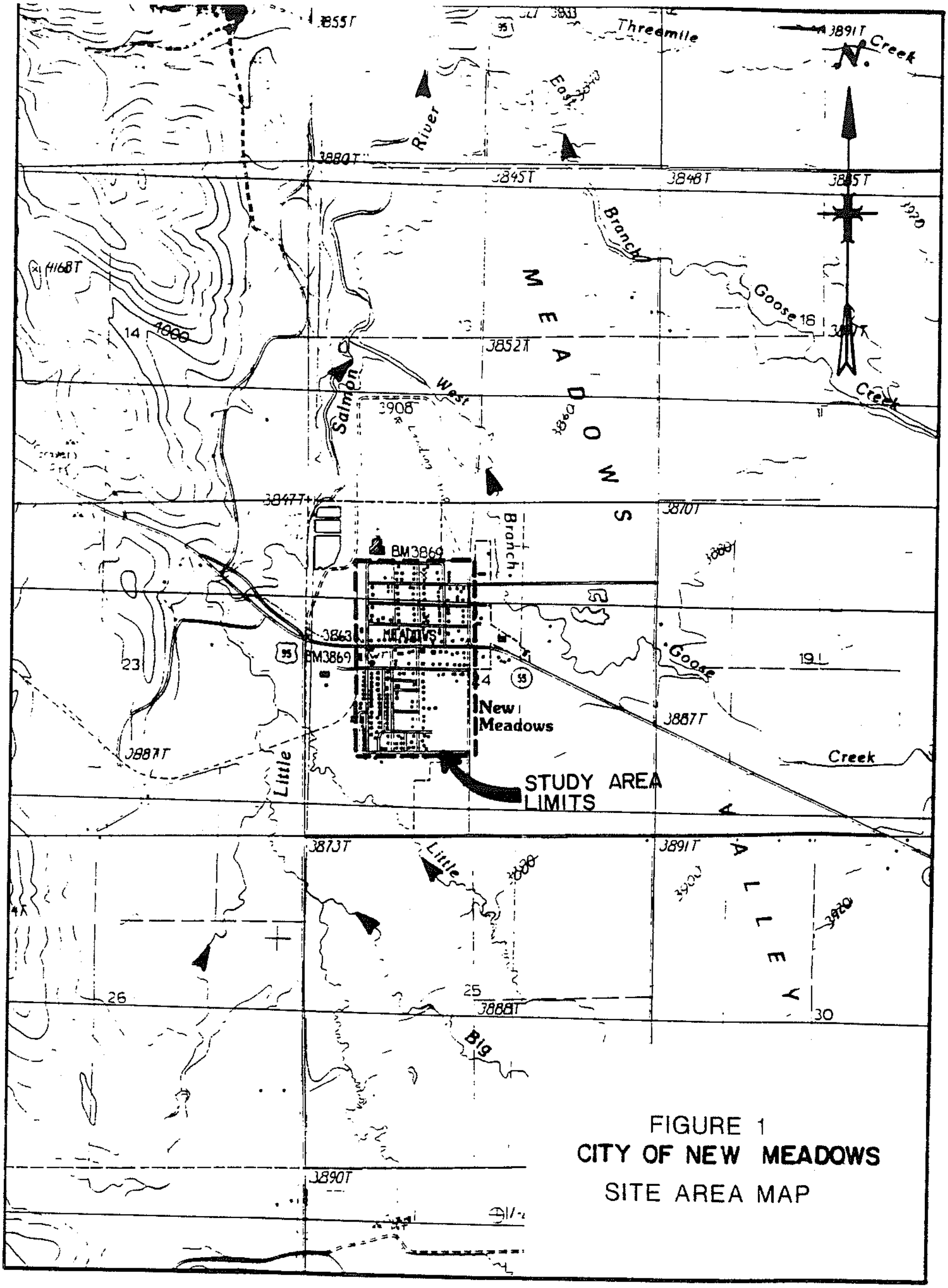
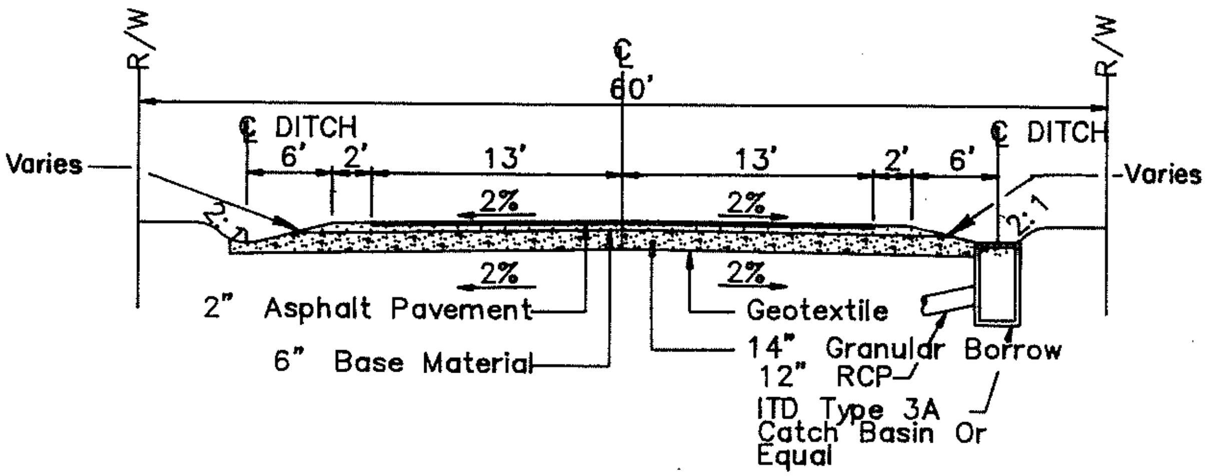


FIGURE 1
CITY OF NEW MEADOWS
SITE AREA MAP



TYPICAL STREET SECTION
WITH STORM DRAIN AND CATCH BASIN

NO SCALE

FIGURE 2

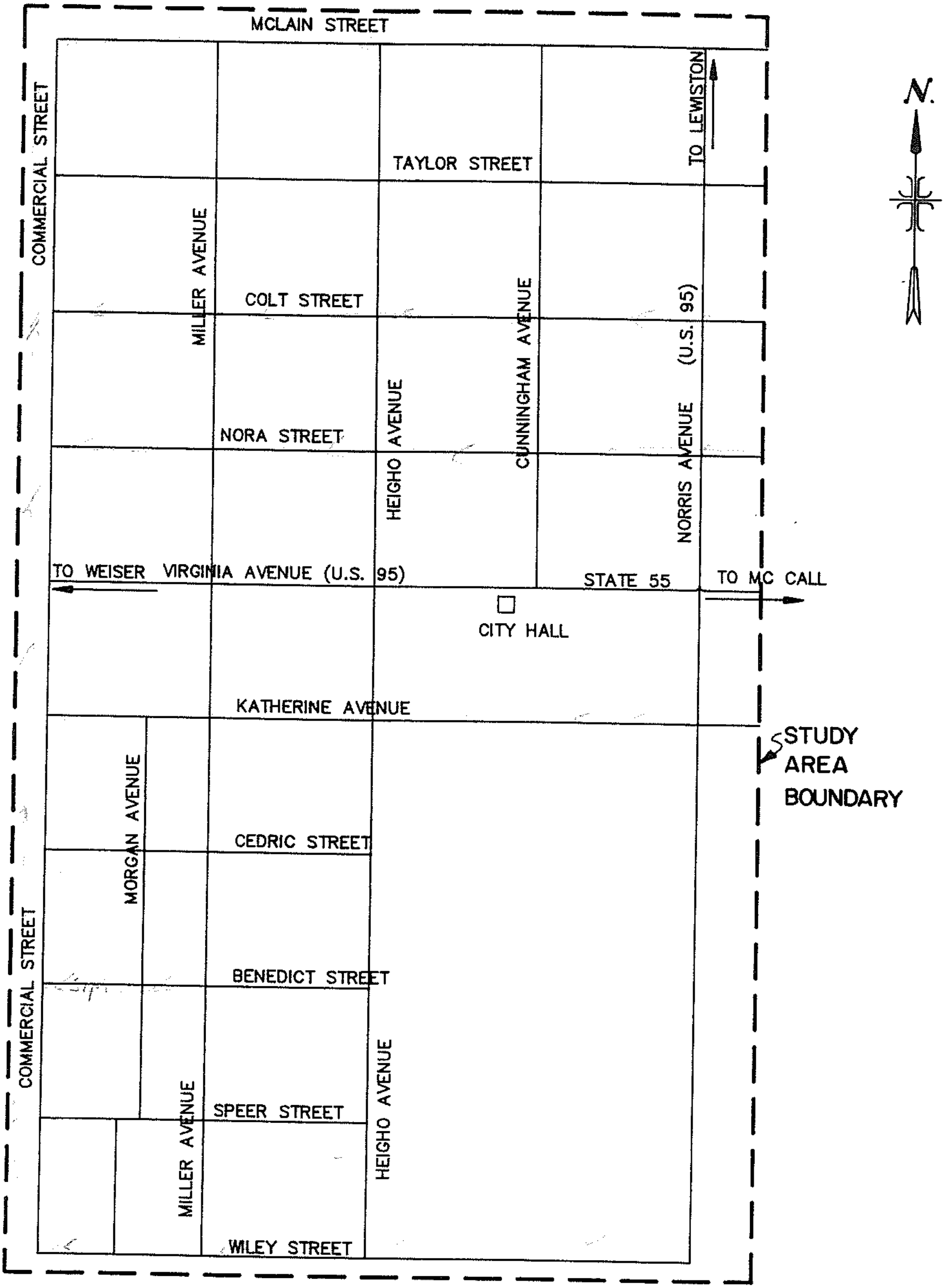


FIGURE 3
STUDY AREA MAP

CITY OF NEW MEADOWS

Roadway Costs - 1991

Preferred Section - 30' Wide

Item	Description	Quantity Per Foot	Unit Cost	Total Cost Per Foot
1.	Excavation	3.34 Cubic Yards	$ 2.00	$ 6.68
2.	Fabric	4.16 Sq. Yards	0.75	3.12
3.	Subbase (Granular Borrow)	1.30 Cubic Yards	6.00	7.78
4.	Base Material	0.40 Cubic Yards	7.50	3.01
5.	Asphalt Pavement	0.38 Ton	40.00	15.00
	Total Cost Per Linear Foot			$35.59

Collector Roads - 24' Wide

Item	Description	Quantity Per Foot	Unit Cost	Total Cost Per Foot
1.	Excavation	2.67 Cubic Yards	$ 2.00	$ 5.34
2.	Fabric	3.33 Sq. Yards	0.75	2.50
3.	Subbase (Granular Borrow)	1.037 Cubic Yards	6.00	6.22
4.	Base Material	0.321 Cubic Yards	7.50	2.41
5.	Asphalt Pavement	0.30 Ton	40.00	12.00
	Total Cost Per Linear Foot			$28.47

Residential Streets - 22' Wide

Item	Description	Quantity Per Foot	Unit Cost	Total Cost Per Foot
1.	Excavation	0.963 Cubic Yards	$ 2.00	$ 1.93
2.	Fabric	3.111 Sq. Yards	0.75	2.33
3.	Subbase (Granular Borrow)	0.963 Cubic Yards	6.00	5.78
4.	Base Material	0.296 Cubic Yards	7.50	2.22
5.	Asphalt Pavement	0.275 Ton	40.00	11.00
	Total Cost Per Linear Foot			$23.26

The above costs are shown for budgetary purposes only. Any modifications available through the use of day labor, volunteer work, or availability of materials from less expensive sources would adjust these costs accordingly.