STATE OF MONTANA
DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
CERTIFICATE OF SUBDIVISION PLAT APPROVAL
(Section 76-4-101 through 76-4-131, MCA 1979)

No. 32-92-L3-10
314L

TO: County Clerk and Recorder
Missoula County
Missoula, Montana

THIS IS TO CERTIFY THAT the plans and supplemental information relating to the subdivision known as King Ranch Phase I

A plat of land located in Sections 33 and 34, Township 15 North, Range 21 West, Principal Meridian, Missoula County, Montana

consisting of 8 lots have been reviewed by personnel of the Water Quality Bureau, and,

THAT the documents and data required by Section 76-4-101 through 76-4-131, MCA 1979 and the rules of the Department of Health and Environmental Sciences made and promulgated pursuant thereto have been submitted and found to be in compliance therewith, and,

THAT the approval of the Plat is made with the understanding that the following conditions shall be met:

THAT the lot sizes as indicated on the Plat to be filed with the county clerk and recorder will not be further altered without approval, and,

THAT each lot shall be used for one single-family dwelling, and,

THAT the multiple family water system will consist of a well drilled to a minimum depth of 25 feet constructed in accordance with the criteria established in Title 16, Chapter 16, Sub-Chapters 1, 3, and 6 ARM and the most current standards of the Department of Health and Environmental Sciences, and,

THAT data provided indicates an acceptable water source at a depth of 170 feet, and,

THAT each individual sewage treatment system will consist of a septic tank and subsurface drainfield of such size and description as will comply with Missoula County Septic System Regulations and Title 16, Chapter 16, Sub-Chapters 1, 3, and 6 ARM, and,

THAT each subsurface drainfield shall have an absorption area of sufficient size to provide 130 square feet per bedroom, and,

THAT the bottom of the drainfield shall be at least four feet above the water table, and,

THAT no sewage treatment system shall be constructed within 100 feet of the maximum highwater level of a 100 year flood of any stream, lake, watercourse, or irrigation ditch, nor within 100 feet of any domestic water supply source, and,

THAT water supply and sewage treatment systems will be located as shown on the approved plans, and,

THAT plans for the proposed water and individual sewage treatment systems will be reviewed and approved by the Missoula County Health Department before construction is started, and,

THAT the developer shall provide each purchaser of property with a copy of the Plat, approved location of water supply and sewage treatment system and a copy of this document, and,

THAT instruments of transfer for this property shall contain reference to these conditions, and,

THAT departure from any criteria set forth in the approved plans and specifications and Title 16, Chapter 16, Sub-Chapters 1, 3, and 6 ARM when erecting a structure and appurtenant facilities in said subdivision without Department approval, is grounds for injunction by the Department of Health and Environmental Sciences.

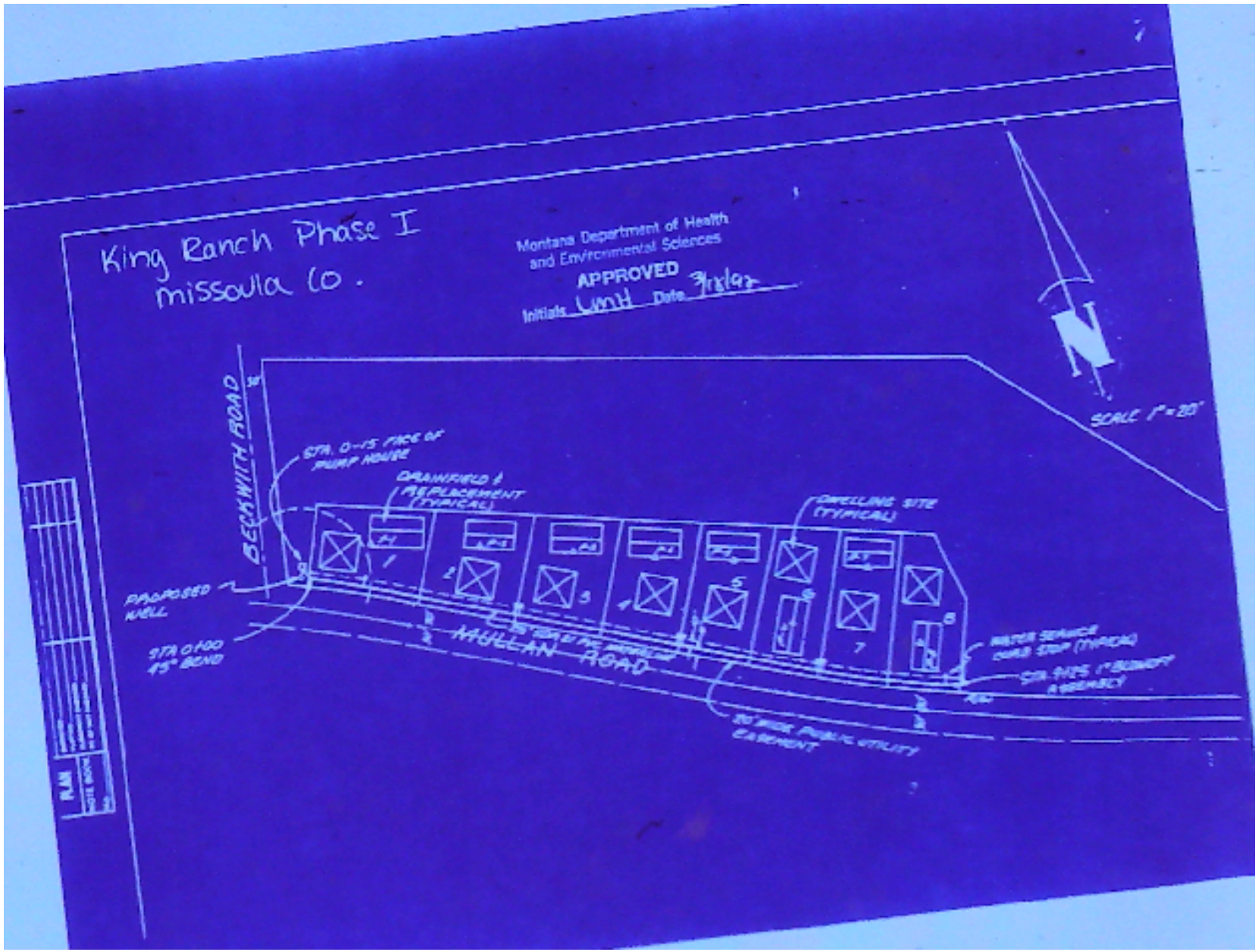
YOU ARE REQUESTED to record this certificate by attaching it to the Plat filed in your office as required by law.

DATED this 19th day of March, 1992.

DENNIS IVERSON
DIRECTOR

By: _____
for Dan L. Fraser, Chief
Water Quality Bureau
Environmental Sciences Division

Owner's Name: Bud King


King Ranch Phase I
missoula Co.
Montana Department of Health
and Environmental Sciences
APPROVED
Initials LWH Date 3/18/92
BECK WITH ROAD
STA. 0+15 FACE OF PUMP HOUSE
DRAINFIELD & REPLACEMENT (TYPICAL)
DWELLING SITE (TYPICAL)
PROPOSED WELL
STA 0+00 45° BEND
MULLAN ROAD
WATER SERVICE CURB STOP (TYPICAL)
STA 9+25 (1" BLOWOFF ASSEMBLY)
30' WIDE PUBLIC UTILITY EASEMENT
SCALE 1" = 20'
PLAN

RECEIVED
AUG 09 1991
MONT. DEPT. OF HEALTH & ENV. SCIENCES
WATER QUALITY BUREAU

ENGINEERS REPORT

PROPOSED MULTI-FAMILY WATER SYSTEM

for

King Ranch - Phase 1

Sections 33 & 34, T 15N R 21W

Missoula County

I. GENERAL

Phase I of the King Ranch will consist of eight single family residential units located along Mullan Road west of Frenchtown, Montana. The development will utilize about 3.5 acres of the 590+ acre Bud King Ranch. The system for Phase I will be designed for eight residences with an estimated population of 24 persons.

A single well, Pneumatic storage tank, and distribution system is proposed capable of maintaining 35 psi. The developer of the system is:

Mr. Bud King
Mullan Road
Frenchtown, Montana 59834

A well users agreement is planned to perpetuate the operation and maintenance of the system. References used in this report are as follows:

1. A.R.M. 16.16.305
2. DHES Circular 84-11
3. AWWA Manual M-22 "Sizing Water Service Lines and Meters"

II. Estimated Water Consumption

Domestic use, 24 persons x 100 gpcd = 2,400 gpd
Irrigation use, 10,000 sf x 2"/week = 1,780 gpd

Maximum daily use 4,180 gallons

The maximum daily production rate becomes 4 gpm if this use is supplied over 10 hrs. Peak domestic demand per AWWA M-22, Fig. 4-4 at 35 F.U. per home and a total F.U. of 280 is 32 gpm. Lawn and garden irrigation for these lots is to be provided as part of the adjoining golf course. As such, only a minimal amount of irrigation flow is considered in this system design. The peak irrigation demand for 1,780 gpd over 10 hrs. is 3 gpm. Therefore, the Peak Design Flow is 35 gpm.

III. Sewage Systems

All lots are proposed with individual septic tanks and drainfields, as shown on the site plan. All drainfields must be located outside of the 100' radius Well Isolation Zone, and no actual influence is expected on the well.

IV. Water Supply

The developer proposes to drill a new well near the southwest corner of Lot 1. The well is 15' higher than the 100 yr-floodplain, and is not adjacent to any known sources of contamination. It will be test pumped to 55 gpm, and the installed pump will produce 35 gpm at the design head.

V. Pump and Pneumatic Tanks

The pump will be capable of providing a minimum of 35 gpm under the following head conditions:

Static head	0'
Pumping level	100'
35 psi delivery pressure . .	81'
Friction, 970 l.f. 2 1/2" . .	9'
PVC @ 35 gpm and 50 l.f. of 1" PE service line	
Total Dynamic Head	190'

A hydro-pneumatic storage tank will be required with an effective volume of 35 gallons in order to provide a minimum run time of 1 minute for the pump. The tank will operate between 35 and 50 psi with a total volume of 119 gallons.

CONSTRUCTION SPECIFICATIONS

for the

King Ranch Phase I

Frenchtown, Montana

July, 1991

Prepared for:
BUD KING CONSTRUCTION CO.
Frenchtown, Montana

Prepared by:
PROFESSIONAL CONSULTANTS, INC.
3115 Russell Street
Missoula, Montana 59801
(406) 728-1880

PCI Project No.4098-89(I)

SET NO. _____

KING RANCH - PHASE I

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

STANDARD DRAWINGS

Drawing No.	Description
2719 - 1	Water Main Line
2719 - 2	Blowoff Valve

MONT. THOMAS H. [illegible] 3753ES REGISTERED ENGINEER & LAND SURVEYOR

Montana Department of Health and Environmental Sciences
APPROVED
Initials LMH Date 3/12/93

SECTION 02221
TRENCH EXCAVATION AND BACKFILL
FOR PIPELINES & APPURTENANT STRUCTURES

01. DESCRIPTION:

This section covers excavation, trenching and backfilling for pipelines and appurtenances, complete. This item shall consist of all necessary clearing, grubbing and site preparation; removal of all material of whatever description that may be encountered; removal and disposal of debris; handling and storage of materials to be used for fill and backfill; all necessary bracing, shoring and protection; pumping and dewatering as necessary; all backfill, preparation of subgrades; and final grading, dressing and cleanup of the site.

02. STANDARD DRAWINGS:

Standard Drawings included in Appendix A of this specification book which are applicable to this section are as follows:

Standard Drawing No. 02221-1 - Typical Utility Trench Detail
Standard Drawing No. 02221-2 - Pipe Bedding Alternate

03. STRIPPING:

When crossing existing or prospective cultivated areas, gravel streets or other developed surfaces, the Contractor shall strip the cover material to full depth at the existing surfacing. This surfacing shall be stockpiled and placed back over the trench after backfilling to the extent that it is acceptable and usable for that purpose. Topsoil shall be removed to full depth of the topsoil, or to a maximum depth of 12 inches, whichever is less.

All established lawn areas cut by the trench or damaged during the course of the work shall be resodded to the complete satisfaction of the property owner.

04. TRENCH EXCAVATION:

A. GENERAL. All excavation, trenching and shoring, and the like, under this contract shall be performed in a manner that meets with the OSHA Department of Labor, Safety and Health Regulations for Construction.

The Contractor shall excavate as necessary at the locations shown on the drawings, staked in the field or otherwise specified for the installation of pipelines. Excavations shall be made at each location by one of the two methods specified herein - either Type 1 or Type 2 trench-excavation. Type 1 trench excavation will be used in most areas. Type 2 will be used when space

limitations or other conditions dictate and as shown on the plans.

Whether trench excavation is by Type 1 or Type 2, the Contractor shall take precautions and protect all adjoining private and public property and facilities, including underground and overhead

utilities, curbs, sidewalks, driveways, structures, and fences. Any disturbed or damaged facilities will be suitably restored or replaced at no cost to the Owner.

Crossings under sidewalks or curbs may be made by tunneling. If the Contractor elects to remove a portion of the sidewalk or curb, he must use a concrete saw for making neat joints, compact the backfill as specified, and pour a new concrete sidewalk or curb section.

During excavation, materials suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. Excavated material shall be piled on one side of the trench only, to permit ready access to existing fire alarm boxes, fire hydrants, valves, manholes and other appurtenances. Surface drainage of adjoining areas shall be unobstructed.

All excavated materials not required or suitable for backfill shall be removed from the site and wasted as directed by the Engineer.

Grading shall be done as may be necessary to prevent surface water from flowing into excavations, and any other water accumulating therein shall be promptly removed. Under no circumstances shall water be permitted to rise in unbackfilled trenches until after the pipe has been placed, tested and covered with backfill. Any pipe having its alignment or grade changed as a result of a flooded trench shall be relaid at no additional cost to the Owner.

The bottom of the trenches shall be accurately graded to the line and grade shown on the drawings. Bedding material shall provide uniform bearing and support for each section of the pipe at every point along its entire length. Bell holes and depressions for joints shall be dug after the trench bedding has been graded, and shall be only of such length, depth and width as required for properly making the particular type joint. Unauthorized overdepths shall be backfilled with bedding material at the Contractor's expense.

There will be no differentiation between common and rock trench excavation, except when listed as separate items on the bid proposal or bid form. Excavation shall include the removal and subsequent handling of all earth, gravel, rock or other material encountered regardless of the type, character, composition or condition of the material.

B. TYPE 1 TRENCH EXCAVATION. Excavation performed as Type 1 will not be shored or sheathed. The sides of all trenches greater than 5 feet in depth shall be sloped back to the angle of repose to preclude collapse, in accordance with Table P-1, Section 1926.652 of OSHA Safety and Health Regulations for Construction, and as shown on Standard Drawing No. 02221-1. In no case shall trench walls above the 5 foot level be sloped steeper than a one foot rise per one foot horizontal (1:1), except for rock excavation.

C. TYPE 2 TRENCH EXCAVATION. Excavation performed and paid for as Type 2 shall be adequately shored and sheathed in accordance

with the minimum requirements of OSHA Regulations, and as shown on Table P-2, Section 1926.652, and as indicated on Standard Drawing 02221-1.

Portable trench boxes or sliding trench shields may be used for performing Type 2 excavation in lieu of a shoring system provided they are designed, constructed, and maintained in a manner which will provide protection equal to or greater than the sheathing or shoring required for the trench.

D. TRENCH DIMENSIONS. Trench dimensions shall be as specified below.

(1) Width. The width of the trench shall be such to provide adequate working room for men to install and join the pipe in the specified manner. The width of that portion of the trench (a) from the existing ground surface to the bottom of the trench for Type 2 Trench Excavation or, (b) from the bottom of the trench to a maximum of 5 feet above the bottom of the trench for Type 1 Trench Excavation, shall be as follows:

(a) A minimum of 3'-6" for pipe sizes 12 inches and under.

(b) A minimum of 2'-0" plus the outside diameter for pipe sizes greater than 12 inches or a greater minimum width as specified by the pipe manufacturer.

(c) A maximum width as specified in the Special Provisions.

(2) Depth of Trench. Trench depth shall be as required for the invert grade or pipe bury shown on the plans or specified elsewhere, plus an additional 4 inches for Type 1 Pipe Bedding. Care shall be taken not to excavate below the required depth. If ledge rock, boulders or large stones are encountered at the bottom of the trench, excavating shall be carried a minimum of 6 inches below the bottom of the pipe for backfilling with Type 1 Pipe Bedding.

When soft or unstable material is encountered at the subgrade which will not uniformly support the pipe, such material shall be excavated to an additional depth as directed by the Engineer and backfilled with Type 2 Pipe Bedding.

E. BLASTING. Blasting for excavation will be permitted only after securing the approval of the Engineer and the hours of blasting will be fixed by the Engineer. The Contractor shall use utmost care to protect life and property. The Contractor shall use only a licensed blaster with experience in the type of blasting contemplated for the project. All explosives shall be safely and securely stored in compliance with local laws and ordinances and all such storage places shall be clearly marked "Dangerous Explosives". No explosives shall be left unprotected where they could endanger persons or property.

When blasting rock in trenches, the Contractor shall cover the area

to be shot with earth backfill or approved blasting mats that will prevent the scattering of rock fragments outside the excavation. Prior to blasting, the Contractor shall station men and provide signals of danger in suitable places to warn people and stop vehicles. The Contractor will be responsible for all damage to property and injury to persons resulting from blasting or accidental explosions that may occur in connection with his use of explosives.

The Contractor shall furnish the following information to the Owner and Engineer prior to commencing blasting operations: Name of his powder man, powder man's experience, type of shot, type of explosives and detonator being used, proof of insurance covering liability for such operation, traffic control plans and planned procedures for protecting the public.

The Contractor's blasting procedures shall conform to Federal, State and local ordinances. The Contractor shall acquire all required permits prior to the start of blasting.

F. EQUIPMENT. The use of trench digging machinery will be permitted except in places where its operation will cause damage to existing structures or features, in which case hand methods shall be employed.

Any equipment operating on tracks, which is to be used on pavement, shall be equipped with suitable pads to prevent damageto the pavement. All pavement damaged during construction by the Contractor's equipment shall be restored to its original condition by the Contractor. No compensation will be allowed for pavement replacement other than as specified elsewhere.

C. DEWATERING. Where ground water is encountered in excavation, it shall be removed to prevent unstable trench conditions, laying of pipe in water, water entering the installed pipe, or any other interference with pipe laying and other construction operations.

The cost of dewatering operations will not be paid for as a separate item, but shall be considered a part of the excavation cost.

H. SHORING, SHEETING AND BRACING. The Contractor shall do all shoring, bracing and tight sheeting required to prevent caving and to protect his workmen, in accordance with Occupational Safety and Health Regulation Requirements, and to protect adjacent property and structures. No extra payment shall be made for these items. The cost thereof shall be considered a part of the cost for Type 2 Trench Excavation. The use by the Contractor of bracing and sheeting in areas not specifically designated for Type 2 Trench Excavation shall be paid for as Type 1 Trench Excavation unless agreed to otherwise by the Engineer.

I. EXCAVATION FOR APPURTENANCES. Excavations for manholes, hydrants, structures and other appurtenances shall be

to be shot with earth backfill or approved blasting mats that will prevent the scattering of rock fragments outside the excavation. Prior to blasting, the Contractor shall station men and provide signals of danger in suitable places to warn people and stop vehicles. The Contractor will be responsible for all damage to property and injury to persons resulting from blasting or accidental explosions that may occur in connection with his use of explosives.

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Any equipment operating on tracks, which is to be used on pavement, shall be equipped with suitable pads to prevent damageto the pavement. All pavement damaged during construction by the Contractor's equipment shall be restored to its original condition by the Contractor. No compensation will be allowed for pavement replacement other than as specified elsewhere.

G. DEWATERING. Where ground water is encountered in excavation, it shall be removed to prevent unstable trench conditions, laying of pipe in water, water entering the installed pipe, or any other interference with pipe laying and other construction operations.

The cost of dewatering operations will not be paid for as a separate item, but shall be considered a part of the excavation cost.

H. SHORING, SHEETING AND BRACING. The Contractor shall do all shoring, bracing and tight sheeting required to prevent caving and to protect his workmen, in accordance with Occupational Safety and Health Regulation Requirements, and to protect adjacent property and structures. No extra payment shall be made for these items. The cost thereof shall be considered a part of the cost for Type 2 Trench Excavation. The use by the Contractor of bracing and sheeting in areas not specifically designated for Type 2 Trench Excavation shall be paid for as Type 1 Trench Excavation unless agreed to otherwise by the Engineer.

I. EXCAVATION FOR APPURTENANCES. Excavations for manholes, hydrants, structures and other appurtenances shall be

sufficient to allow for adequate compaction on all sides. The depth, provisions for removing water, and other applicable portions of these specifications shall apply to excavation for appurtenances.

05. TRENCH BACKFILL:

A. GENERAL. All trenches shall be backfilled immediately after grade, alignment and jointing of the pipe has been inspected and approved by the Engineer. Leakage tests, pressure tests or tests for alignment and grade shall be performed after backfill. If any test fails, the Contractor shall be responsible for work required to correct the defects at no additional cost to the Owner.

B. PIPE BEDDING MATERIAL. (Refer to Special Provisions for any additional minimum bedding requirements.)

(1) Type 1 Pipe Bedding. Type 1 pipe bedding shall consist of the 4 inches of bedding material under the pipe and the bedding material around and over the pipe to a point 6 inches above the top of the pipe. The 4 inches of bedding material under the pipe and up to the spring line of the pipe shall generally be described as consisting of sand, sandy gravel, or fine gravel having a maximum size of 3/4 inches and having a maximum plasticity index of 6 as determined by AASHTO Methods T89 and T90. Refer to Standard Drawing 02221-2 and Special Provisions for other requirements.

Bedding material from the springline to 6 inches over the pipe shall consist of select earth, sand or fine gravel, free from clods, lumps of frozen material, or stones larger than 1-1/2 inches in their maximum dimensions. Where wet or otherwise unstable conditions exist, the material in this zone shall be free draining and nonplastic. Where suitable material is available in the material excavated from the trench, the Contractor may procure the select material by screening, sifting or manually sorting the material removed from the trench, as approved by the Engineer.

To prevent migration of material from around the pipe, sand, sandy gravel or a material composed mainly of sand shall not be used for bedding material in the pipe zone where ground water is or will be present or where existing material contains voids which would allow migration. If these conditions are present, all bedding material shall be well graded. If ground water is encountered, well graded gravel will be placed at the direction of the Engineer and paid in accordance with the Special Provisions.

Bedding material under and around the pipe to 6 inches above the top of the pipe shall be placed by hand or other careful manner so as not to damage or disturb pipe, in maximum layers of 6 inches and thoroughly compacted by tamping. Special care shall be taken to assure complete compaction under the haunches of the pipe. Backfill material shall be placed in the trench for its full width on each side simultaneously. Refer to Special Provisions for any special compaction requirements in this area.

Water settling of this portion of the trench will not be allowed. The addition of water shall be limited to that required for optimum moisture for maximum compaction of the material.

(2) Type 2 Pipe Bedding. Type 2 pipe bedding shall be used as directed by the Engineer to replace soft, spongy or other unsuitable material encountered in the trench bottom, and shall extend from the bottom of the Type 1 bedding material to the depth necessary to support the pipe . The Type 2 bedding material shall consist of suitable granular material meeting the following gradation, and shall have a maximum plasticity index of 6.

Sieve Opening	% Passing
3 inch	100
Number 4	0 - 25
Number 8	0 - 10

C. TRENCH BACKFILL:

(1) General. After the select pipe bedding material has been placed and compacted as specified above, the remainder of the trench backfilling shall be done. All backfill material shall be free from cinders, ashes, refuse, organic and frozen material, boulders, or other materials that are unsuitable. From one foot above the top of pipe to 6 inches below the ground surface, or to the subgrade elevation for streets or paved surfaces, material containing stones up to 8 inches in the greatest dimen- sion may be used. A minimum of 18 inches of compacted cover is to be in place, over the pipe, before any heavy pieces of compaction equipment are allowed to be placed in the trench.

Material shall be placed in layers so that, after compaction, the maximum layer thickness shall be 8 inches. Thicker layers may be allowed if the Contractor can satisfactorily demonstrate to the Engineer, through the use of a test strip or section, that his methods and equipment are capable of achieving the specified density.

Trench backfill from the top of the pipe bedding material to ground surface or to the subgrade of street surfacing is separated into three classifications. Type A Trench Backfill refers to compacted backfill in streets or paved areas. Type B Trench Backfill is designated for alleys, fields, borrow pits, unimproved streets or other unsurfaced areas where a lesser degree of compaction of the trench backfill is required. Type C Trench Backfill may be designated for open and unimproved areas outside of the public right-of-way where special compaction of the backfill is not required. Locations of the types of backfill required shall be as shown on the plans or as designated in the Special Provisions.

(2) Type A Trench Backfill. Materials used for backfill shall be carefully deposited in layers as specified above, wetted to within 3% of optimum moisture content, and compacted to at least 95 percent of maximum dry density, as determined by AASHTO T99 or, for material which does not exhibit a typical well-defined moisture-density curve, 70 percent relative density as determined by ASTM D4253 and D4254.

Compaction by flooding will not be permitted. Wherever the trenches have not been properly filled, or if settlement occurs, they shall be reopened to the depth required for proper compaction and refilled and recompacted.

For graveled streets, the backfill shall be completed by blading the stripped gravel back over the trench.

(3) Type B Trench Backfill. Materials used for backfill shall be carefully deposited in layers as specified above, wetted to within 3% of optimum moisture content, and compacted to at least 90 percent of maximum dry density, as determined by AASHTO T-99 or, for material which does not exhibit a typical well-defined moisture-density curve, 50 percent relative density as determined by ASTM D4253 or D4254.

In cultivated areas, the stripped topsoil shall be placed uniformly over the backfilled trench to the original depth. The top soil shall not be compacted but shall be graded to provide a smooth surface conforming to the adjoining ground surfaces . Any settlement of the trench surface below final surface grade shall be remedied by the Contractor throughout the warranty period at no additional cost.

Compaction by flooding will not be permitted. Wherever the trenches have not been properly filled, or if settlement below final grade occurs, they shall be reopened to the depth required for proper compaction, refilled and recompacted.

(4) Type C Trench Backfill. Materials used for Type C Trench Backfill shall not require special compaction. However, the material shall be placed in layers to achieve a density approximately equal to the density of the existing soil.

The Contractor may be required to mound excess earth over the top of the trench so that a depression will not be formed after the trench settles. Placement of material in cultivated areas shall conform to the requirements of Type B Trench Backfill.

(5) Replacement of Unsuitable Backfill Materials. Wherever in excavating the trench the native trench material consists of peat, soft clay, quicksand, or other material which, in the opinion of the Engineer , is unsuitable for use as backfill material or which cannot be readily conditioned or dryed to be made suitable, such material shall be removed and disposed of by the Contractor . The material thus removed shall be replaced with suitable surplus material obtained from trench excavation

materials from other areas within the limits of the project at no additional cost. If surplus material is not available within the limits of the project, the Contractor shall furnish suitable material from an approved borrow source which shall be paid as Imported Backfill Material. All such material shall be placed and compacted in accordance with the requirements of the classification of backfill specified for the trench section.

D. BACKFILLING FOR APPURTENANCES. Backfill around appurtenances shall be deposited in such a manner as not to disturb the appurtenance from its proper alignment, and then compacted to the finished grade. Backfill material, compaction

and backfill procedures shall conform to the requirements of the related Type A or Type B Trench Backfill as specified herein for trenches.

E. BACKFILL ABOVE ORIGINAL GROUND FOR MINIMUM COVER REQUIREMENTS. Where shown on the plans, the Contractor shall provide embankment over the pipe, above the original ground surface, to a height which will satisfy the minimum depth of cover requirements. Such embankment shall be constructed to the cross section shown on the plans. No additional compensation will be paid for embankment unless shown as a specific item on the proposal.

F. DETECTABLE BURIED WARNING TAPE. The use of warning tape is optional and when used shall not be relied upon as a primary locating device. Warning tape shall have a minimum overall thickness of 5.5 mils consisting of a minimum 3.5 mil solid aluminum core running the full length and width of the tape encased in a color coded inert plastic jacket which is impervious to all known alkalis, chemical reagents, and solvents found in the soil. Color coding shall be in conformance with the APWA/ULCC Color Code . Warning tape shall have a minimum tensile strength of 5000 psi and a maximum imprint length of 36 inches. Warning tape shall be 3 inches in width and shall be buried no more than 18 inches below finish surface grade unless specified otherwise.

G. TESTING. Field density tests of the compacted fill will be performed at all levels. These tests will be performed by the Engineer at the Owner's expense to verify that the specified density is being obtained. The cost of failing tests will be borne by the Contractor.

The Contractor may be required at the direction of the Engineer, to provide the necessary equipment and labor to excavate test holes into the compacted backfill to allow testing below the surface of the layers.

H. SPECIAL COMPACTION REQUIREMENTS. The Contractor is cautioned regarding the need for careful attention to compaction in areas around existing facilities and obstructions and in areas where larger, trench-type compaction equipment is not suitable for use. Such areas include, but are not limited to, service line trenches, manholes, valve boxes, existing utilities and

drainage and miscellaneous structures and pipes.

06. TRENCH MAINTENANCE .

The warranty period and conditions for work under this section shall be as specified in the General and Supplementary Conditions.

07. CONTRACTOR'S SAFETY RESPONSIBILITIES:

Whether utilizing Type 1 or Type 2 Trench Excavation, the Contractor shall be responsible for enforcing safety and maintaining safe working conditions in all trenching, shoring, and blasting operations to conform to OSHA regulations and any applicable local requirements.

The Contractor shall employ qualified, properly trained personnel to design shoring, perform safety inspections of the trenches, and supervise the handling of explosives, and other operations involving safety procedures, as prescribed by OSHA.

08. TRAFFIC CONTROL AND WARNING DEVICES:

The Contractor shall construct the project in such a manner as to minimize the interruption of the use of roads, highways or streets involved and shall provide access for emergency vehicles and to fire hydrants at all times.

The Contractor is responsible for providing traffic control devices in adequate numbers and locations to alert the public, motorists and pedestrians of hazardous conditions in accordance with Section 01570; CONSTRUCTION TRAFFIC CONTROL.

09. PROTECTION OF EXISTING PROPERTIES:

A. GENERAL. Prior to beginning construction, the Contractor must contact all utility companies and/or public utilities having underground installations: sewer, telephone, water, fuel, gas, electric, etc., that may be encountered during the excavation. The Contractor must locate any underground installations and shall preserve intact any underground pipes or other utilities encountered during construction (except as hereinafter permitted) provided their location is such that they do not interfere with new pipelines or structures being installed. In case such utilities or other structures are accidentally broken, they shall be immediately replaced in a condition conforming to the standard repair practice of the utility, all at the Contractor's expense.

Existing water mains, sanitary sewers and storm drains shown on the plans, which will intersect the new pipelines or structures, will be relocated by the Contractor in accordance with the plans and specifications. No separate payment will be made for this unless shown as a bid item. In the event the Contractor is authorized to relocate the mains or sewers, and the work is determined by the Engineer to be a change in the original work, payment will be made under applicable portions of the General

Conditions covering such changes.

Existing water, sanitary sewer and storm drain services, which will intersect new pipelines or new structures , shall be replaced by the Contractor, and if determined by the Engineer to be a change in the original work, payment will be made under applicable portions of the General Conditions covering such changes.

Existing water services from the mains to private property which interfere with trenching operations shall be cut and replaced only with permission of the Engineer, and if allowed, shall be done at the Contractor's expense. The use of such water service shall in no case be interrupted for more than 4 hours, unless specifically permitted in writing by the user.

Existing water mains and water services shall be protected from freezing at all times during construction operations.

B. PRIVATELY OWNED UTILITIES. Gas mains, underground electrical and telephone cables, telephone poles, light poles, etc., required to be moved to make way for new construction will be moved by others unless designated otherwise on the plans.

C. EXPLORATORY EXCAVATION. Location of buried utilities that might interfere with alignment or grade shall be verified by exploratory excavation prior to construction. If any existing utility interferes with the work in either alignment or grade and has to be moved, such work shall be done by the Contractor, and if not a bid item and if determined by the Engineer the work is a change in the original work, payment will be made under applicable portions of the General Conditions covering such changes.

When authorized by the Engineer, the Contractor shall provide a backhoe to excavate and backfill for determination of grade and/or the exact location of buried utilities. The Contractor shall be reimbursed for this expense at the unit price bid per hour consisting of the actual time, to the nearest one-half hour, which the equipment is used in actual excavating and backfilling operations including standby time between excavation and backfilling which is required to allow the Engineer to make the necessary survey of the underground utility. The rated size of the backhoe shall be a minimum of 3/8 C.Y. based upon manufacturer's rated capacity of the unit. Should the Contractor elect to provide a smaller backhoe than the standard 3/8 yard specified, the bid item shall be reduced in direct proportion that the rated capacity of the unit used bears to the 3/8 cubic yard unit. Should the Contractor elect to provide a larger backhoe than the standard 3/8 cubic yard specified, the unit shall be rated for pay purposes as 3/8 yard and no larger. This item shall include providing the equipment on-site, manned and fueled, as well as a laborer with shovel to assist the equipment operator in exposing the utility. The Contractor shall be

responsible for exercising the required care to avoid damaging the

utility and any damage to the utility from this operation shall be repaired by the Contractor at his own expense.

D. MAINTENANCE OF FLOWS. Adequate provisions shall be made for maintaining the flow of sewers, drains and water courses encountered during construction. Culverts, ditches, fences, crosswalks and structures which are disturbed by this construction shall be satisfactorily restored to their original condition upon completion of the work.

E. STRUCTURES. The Contractor shall exercise every precaution to prevent damage to existing buildings or structures in the vicinity of his work. In the event of such damages, he shall repair them to the satisfaction of the owner of the damaged structure and at no cost to the Owner or the structure owner.

F. OVERHEAD UTILITIES. The Contractor shall use extreme caution to avoid a conflict, contact or damage to overhead utilities, such as power lines, street lights, telephone lines, television lines, poles or other appurtenances during the course of construction of this project.

G. PAVEMENT REMOVAL. Where trench excavation or structure excavation requires the removal of curb and gutter, concrete sidewalks, or asphaltic or concrete pavement, the pavement or concrete shall be cut in a straight line parallel to the edge of the excavation by use of a spadebitted air hammer, concrete saw or similar approved equipment to obtain a straight, square clean break. Pavement cuts shall be 2 feet wider than the actual trench opening. If edges are broken during construction, the edges shall be recut prior to concreting or paving operations.

H. SURVEY MARKERS AND MONUMENTS. The Contractor shall use every care and precaution to protect and not disturb any survey marker or monuments, such as those that might be located at lot or block corners, property pins, intersection of street monuments or addition line demarcation. Such protection shall include marking with flagged high lath and close supervision. No monuments shall be disturbed without prior approval of the Owner and Engineer. Any survey marker or monument that is disturbed or destroyed by the Contractor, without approval during the construction of this project, shall be replaced at no cost to the Owner by a licensed land surveyor.

10. CLEANUP:

As work progresses, that portion of the work completed shall be cleared of debris and brought to the finished grade. Upon completion of the work, the entire site shall be cleared of all debris and ground surfaces shall be finished to smooth, uniform

slopes and shall present a neat and workmanlike appearance. All rocks brought to the ground surface by excavation or backfilling operations shall be removed.

11. TIME OF OPEN TRENCHES:

The Contractor will be required to conduct his work so that trenches will remain open a minimum possible time.

No trench excavating shall begin until approved compaction equipment is at the site where the excavating is to take place. The maximum distance between backfilling and compaction operations and the end of newly installed pipe shall be 200 feet in existing streets and 500 feet in all other areas, and the maximum distance between the newly installed pipe and the excavator shall be 100 feet in existing streets and 200 feet in all other areas. For each work group consisting of a trench excavator, a pipe laying crew, and a backfilling and compacting crew, the maximum allowable open ditch at any time will be 300 feet in existing streets and 700 feet in all other areas. The maximum distance behind the end of the new pipe shall be 1,500 feet for gravel replacement, base placement or pavement replacement.

Certain conditions, as provided in the Special Provisions of these specifications, may necessitate the closing of certain sections of trench prior to daily, weekend or holiday shutdown.

12. METHOD OF MEASUREMENT AND BASIS OF PAYMENT:

A. GENERAL. The following items shall constitute pay items for the work covered under this section of the specifications. Payment for these items shall be full compensation for providing all materials, tools, labor and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

B. TRENCH EXCAVATION AND BACKFILL. No separate measurement and payment will be made for this item. All costs for this item are to be included in the unit price bid for pipe, complete in-place.

The upper limit of the TRENCH EXCAVATION AND BACKFILL item shall be defined as the top of subgrade. Details regarding the various types of surface restoration will be found in the applicable specification sections.

C. PIPE BEDDING - TYPE 1 AND 2.

(1) Type 1 Pipe Bedding. Approved material for Type 1 Pipe Bedding shall be included in the price of the pipe installation and no measurement or additional payment shall be made for furnishing or placing this material.

(2) Type 2 Pipe Bedding. Approved material for Type 2 Pipe Bedding to replace soft or unstable material, shall be measured in cubic yards of material furnished, in-place, for the depth required and directed by the Engineer. Payment for Type 2

Pipe Bedding will be made at the contract unit price bid per cubic yard, which price shall include furnishing, placing and compacting the bedding material as specified and all other work necessary or incidental for completion of the item.

Payment will be made under: Type 2 Pipe Bedding - Per Cubic Yard.

D. IMPORTED BACKFILL MATERIAL. When satisfactory backfill material is not available within the limits of the project, suitable backfill material imported from borrow sources outside the limits of the project shall be measured in cubic yards of material furnished, in place, for the depth required and directed by the Engineer. Unless otherwise directed, the maximum trench width for measurement and payment shall be 2.5 feet plus the inside pipe diameter, measured between vertical planes for the entire depth required. Payment for imported backfill material will be made at the contract unit price bid per cubic yard, which price shall include furnishing, placing, and compacting the backfill material as specified and all other work necessary or incidental for completion of the item.

No separate measurement and payment will be made for this item when suitable surplus material is available within the limits of the project, in which case all costs for this item are to be included in the unit price bid for pipe, complete in-place.

Payment will be made under: Imported Backfill Material - Per Cubic Yard.

E. EXPLORATORY EXCAVATION. Measurement of this item shall be made for the actual time, to the nearest one-half hour, which the equipment is used and authorized by the Engineer for actual exploratory excavation and backfilling operations, including standby time between excavation and backfilling to allow the Engineer to make the necessary survey of the underground utility. Payment will be made at the contract unit price bid per hour, which price shall include providing the equipment, on-site, manned and fueled, plus a laborer with shovel to assist the equipment operator in exposing the utility. Where exploratory excavation is outside the construction limits, payment shall also include any compaction of the backfill required.

Payment will be made under: Exploratory Excavation - Per Hour.

SECTION 02610A

WATER MAIN MATERIALS

01. GENERAL:

All water main pipe and fittings furnished shall be as called out in the Proposal and/or specified herein. Pipe strength classifications shall be as shown on the plans, listed in the Proposal or specified herein.

02. CERTIFICATION BY MANUFACTURER:

The Contractor shall furnish a certification by the manufacturer covering all pipe and fittings to be furnished, certifying that the pipe and fitting comply with applicable specifications.

03. DUCTILE IRON PIPE:

Ductile iron pipe shall conform to the provisions of AWWA C151, American National Standard for Ductile Iron Pipe. Wall thickness shall be Class 51 unless specified otherwise.

Underground pipe and fitting joints shall be mechanical joint or push-on joints conforming to AWWA C111 unless designated otherwise.

The interior of the pipe shall have a cement mortar lining conforming to the requirements of AWWA C104. The outside surface of pipe designed for underground service shall receive a bituminous coal tar base coating approximately 1 mil thick.

04. POLYVINYL CHLORIDE (PVC) PRESSURE PIPE:

PVC pipe for the water mains shall meet the requirements of AWWA C900, Polyvinyl Chloride Pressure Pipe made to ductile iron O.D.'s for "Push-On" joints. Pipe joints shall be bell and spigot with an elastomeric gasket. Pipe shall be Class 150 and shall have a DR of 18 unless specified otherwise.

05. CONCRETE CYLINDER PIPE:

Reinforced concrete water pipe, steel cylinder type, prestressed, shall conform to the provisions of AWWA C301, Prestressed Concrete Pressure Pipe, Steel Cylinder Type, For Water and Other Liquids. Pipe joints shall be bell and spigot with a rubber gasket. Pipe class, marking, specials, lengths, etc. shall be as specified in the Special Provisions.

06. CAST IRON AND DUCTILE IRON FITTINGS:

Fittings shall be 1) Class 250 fittings conforming to AWWA C110, latest edition, Gray-Iron and Ductile Iron Fittings For Water And Other Liquids, or 2) compact fittings conforming to AWWA C153, latest edition, Ductile Iron Compact Fittings For Water And Other Liquids. Joints shall be mechanical joint or push-on joints conforming to AWWA C111. The interior of the fitting shall have a cement mortar lining conforming to AWWA C104. The exterior of

the fitting shall have a bituminous tar coating approximately 1 mil thick. All compact fittings shall have a rated working pressure of 350 psi with laying lengths as recommended by the manufacturer.

07. COUPLINGS:

Pipe couplings shall be either: 1) the cast type with cast iron or ductile iron sleeves and malleable or ductile iron flanges, or; 2) gray iron or ductile iron, mechanical joint solid sleeves, with a minimum length of 12 inches, conforming to Section 02610A.06 herein. Use of the first type shall be limited to a maximum diameter of 16 inches . Gaskets shall be manufacturers standard suitable for use in potable water systems. Bolts and nuts shall be Cor-Ten, Dura-Bolt, or stainless steel. Coating shall be the manufacturers standard unless specified otherwise. The first type of coupling shall be as manufactured by Rockwell, Dresser, Ford, Romac, or an approved equal.

08. TAPPING SLEEVES AND VALVES:

Tapping sleeves shall be either: 1) gray iron or ductile iron, split-sleeve, mechanical joint type with end and side gaskets, or; 2) split-body type with circular gasket forming a seal around the circumference of the outlet. Both types shall have a class 125, ANSI B16.1 outlet flange. Both types shall be rated for a minimum of 150 psi working pressure and shall contain a threaded plug for testing purposes on the neck or body of the tapping sleeve. Gaskets shall be manufacturers standard suitable for use in potable water systems. Bolts and nuts shall be Cor-Ten, Dura-Bolt, or stainless steel. The second type shall be coated with the manufacturers standard . The use of the second type of sleeve is limited to metal pipe. Any sleeves used on PVC pipe shall be of the first type above. The first type of sleeve shall be as manufactured by Mueller Company, Model H-615, Tyler tapping sleeve, or approved equal, with second type as manufactured by Rockwell International, Model 622, Fort FTS, or approved equal.

Tapping valves shall meet the applicable requirements for gate valves as specified in Section 02718; WATER VALVES AND FIRE HYDRANTS, with flanged inlets compatible with the flange of the tapping sleeve and mechanical joint outlet.

09. SPECIAL FITTINGS:

Special fittings shall be in accordance with the plans and/or Special Provisions.