

APPLICATION OF ALASKAN NORTHWEST
NATURAL GAS TRANSPORTATION COMPANY
FOR AN ORDER APPROVING COST ESTIMATE
FORMAT.

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79-08-08a

NORTHWEST ALASKAN PIPELINE COMPANY

1801 K Street, N.W.
Washington, D.C. 20006
(202) 466-5850
REA-79-1105

August 8, 1979

Mr. Kenneth F. Plumb
Secretary
Federal Energy Regulatory Commission
Room 9310
825 North Capitol Street, N.E.
Washington, D.C. 20426

RE: APPLICATION FOR AN ORDER APPROVING COST ESTIMATE FORMAT
AT DOCKET NO. CP78-123, et al.

Dear Mr. Plumb:

Alaskan Northwest Natural Gas Transportation Company
(The Partnership) herewith submits for filing an original
and nineteen (19) copies of its Application for an Order
Approving Cost Estimate Format.

The Partnership has made service on all of the parties
to the official service list in the above-referenced docket.

Respectfully submitted,

NORTHWEST ALASKAN PIPELINE COMPANY



Cuba Wadlington, Jr.
Director, Regulatory Affairs

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

In the Matter of

Alaskan Northwest Natural
Gas Transportation Company) Docket No. CP78-123, et al.

APPLICATION OF
ALASKAN NORTHWEST NATURAL GAS TRANSPORTATION COMPANY
FOR AN ORDER APPROVING COST ESTIMATE FORMAT

Alaskan Northwest Natural Gas Transportation Company (the Partnership), pursuant to the Alaska Natural Gas Transportation Act of 1976 ("ANGTA"), 1/ the Natural Gas Act, 2/ the Decision and Report to Congress on the Alaska Natural Gas Transportation System ("ANGTS") issued by the President of the United States on September 22, 1977, ("President's Decision"), 3/ and the Commission's Order Vacating Prior Proceedings and Issuing Conditional Certificate of Public Convenience and Necessity issued December 16, 1977, hereby applies for an order approving the proposed Cost Estimate Format to be used by the Partnership, in the submission of the Partnership's Certification Cost and Schedule Estimate to the Federal Energy Regulatory Commission ("Commission") as a part of its Application for Final Certificate for Public Convenience and Necessity.

In support thereof, the Partnership would show as follows:

-
- 1/ Public Law 95-586, 90 Stat. 2903
2/ 15 U.S.C. 717 et seq.
3/ Public Law 95-158, 91 Stat. 1268

1.

BACKGROUND

On June 8, 1979, the Commission issued Order No. 31, at Docket No. RM78-12, 4/ Setting Values for Incentive Rate of Return, Establishing Inflation Adjustment and Change in Scope Procedures, and Determining Applicable Tariff Provisions. In such Order, the Commission set out certain Terms and Conditions. Condition No. 8, Cost Estimate Format, stated as follows:

"All cost estimates shall be submitted to the Commission according to a Cost Estimate Format to be determined by the Commission. Prior to submittal of the Certification Cost and Schedule Estimate, the applicant may submit to the Commission a proposal for the Cost Estimate Format. The Cost Estimate Format will specify the functional categories or components into which the total cost estimate must be divided, according to the time period in which the costs are estimated to occur. The breakdown of costs shall be in sufficient detail such that the Commission may compare the various cost estimates and determine the reasonableness of any changes ..."

4/ Applications for Rehearing are pending.

II.

Basic Requirements of Cost Estimate Format

The Partnership believes that the second finance condition of the President's Decision and the certification necessities of the Commission, as outlined in Order No. 31, impose five (5) basic requirements which the Cost Estimate Format should satisfy. The five requirements are:

1. Provide information to validate the reasonableness of the Certification Cost Estimate in comparison with the March 1977 estimate.
2. Provide a cost estimate that is structured to permit implementation of change in scope procedures.
3. Provide a cost estimate that is structured to permit implementation of a procedure to adjust actual costs for inflation experienced during the period of construction.
4. Provide information to permit a comparison of the Certification Cost Estimate to the Final Design Cost Estimate and to analyze variances between each of them.
5. Provide a baseline estimate for use in the operation of a cost tracking system to compare actual costs to planned costs.

III.

Requirements DiscussionA. Comparison with Original Filed Estimate

The proposed format to accomplish this requirement results in the recasting of the 1977 filed estimate in the format of the Work Breakdown Structure ("WBS"), ^{5/} appended hereto, and then escalating the 1975 prices to 1980 prices, the presently anticipated base year for certification filing.

Recasting the 1977 filed estimate to the WBS will provide the uniform structure for making the comparison with the certification cost and schedule estimate and will be presented in the format of Exhibit 1. Exhibits 2 through 29 will provide the necessary format to display the methods of escalating the 1977 filing estimate and making its comparison with the Certification Cost Estimates.

B. Application of Change in Scope Adjustments

The basis for the implementation of the scope change procedure will be established by the final design cost estimate. This estimate, when approved, will depict estimated resource quantities and costs which, when escalated, will be converted to the project baseline budget. Allowable scope changes are to be quantified in terms of resource, quantities, and current year prices and will be added to the appropriate baseline budget element to revise project costs. The detailed composition of the final design Cost Estimate Format to meet this requirement are illustrated in Exhibits 40 through 56.

C. Application of Inflation Adjustments

The Final Design Cost Estimate will fulfill the requirement to permit the implementation of the inflation adjustment procedure. The estimate will be converted to 1980 base year dollars and recast by inflation categories to establish the basis for escalation evaluation. As actual costs are expended, they will be de-escalated according to the appropriate index for the specific category and contrasted with the 1980 base dollar estimate for performance measurement purposes. Exhibits 30 through 39 and 76 through 85 describe the Cost Estimate Format to be used to establish the inflation adjustment base.

^{5/} The Partnership is not requesting approval of the WBS which may be adjusted from time to time as project planning proceeds.

D. Comparison of Certification Cost Estimate and Final Design Cost Estimate

The comparison of the Certification Cost Estimate and the Final Design Cost Estimate will be made to evaluate deviations in quantities of labor, materials or services between the two. Although the comparison will be made in dollars, both estimates will utilize the same pricing methods and any deviations will be attributable to changes in resource quantities only, unless the Final Design requires a type of labor, material or services input not assumed to be used in the Certification Cost Estimate. Exhibits 57 through 65 will provide the format for making this estimate comparison.

E. Cost Controls

The cost estimate to be used for the cost tracking system will be the Final Design Cost Estimate. The estimate will be made in real year or escalated dollars and will be utilized as the project baseline budget. As the budget, actual costs incurred during construction will be contrasted with it at select intervals for performance evaluation, i.e., calculation of an interim cost performance ratio. When coupled with the inflation adjustment evaluation, the financial status of the project can be successfully evaluated in terms of cost effectiveness for control and IROR purposes. Exhibits 66 through 75 illustrate the formats to be used to present the baseline cost tracking estimate.

IV.

Conclusion

The Partnership believes that the Cost Estimate Format for submitting the Certification Cost and Schedule Estimate must first satisfy the requirements of the President's Decision and must provide the Commission with the necessary information for adjudging the Certification Cost and Schedule Estimate in accordance with the Commission's regulatory requirements.

As heretofore outlined, the Partnership has determined that the requirements for submitting the Certification Cost and Schedule Estimate, of both the President's Decision and the Commission's certification process, essentially lies in five (5) areas. As established herein, the Partnership believes that the proposed Cost Estimate Format will satisfy such defined requirements.

6.

V.

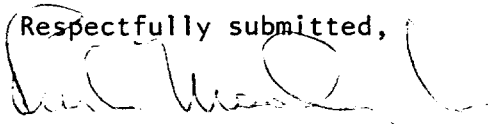
The names, titles and mailing addresses of the persons to whom all correspondence and communications concerning this application should be addressed are as follows:

*Cuba Wadlington, Jr.
Director, Regulatory Affairs
Northwest Alaskan Pipeline Company
Suite 901
1801 K Street, N.W.
Washington, D.C. 20036

*Rush Moody, Jr., Esquire
Akin, Gump, Hauer & Feld
Suite 400
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036

WHEREFORE, the Partnership respectfully requests that the Commission issue an order pursuant to ANGTA, the Natural Gas Act and the President's Decision, approving the Cost Estimate Format, as described herein, for the submission of the Certification Cost and Schedule Estimate.

Respectfully submitted,



Rush Moody, Jr.

Akin, Gump, Hauer & Feld
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036
(202) 457-7633

Attorneys for

ALASKAN NORTHWEST NATURAL GAS
TRANSPORTATION COMPANY

NORTHERN BORDER PIPELINE COMPANY

Washington, D.C.
August 8, 1979


*Designated to receive service in accordance with Section 1.17(c) of the Rules of Practice and Procedure.

AFFIDAVIT


District of Columbia:

ss

Cuba Wadlington, Jr., being first duly sworn, deposes and says that he is Director, Regulatory Affairs, for Northwest Alaskan Pipeline Company, that he has read the foregoing Application, that the statements contained therein are true and correct to the best of his knowledge, information and belief, and that he is authorized to file same with the Federal Energy Regulatory Commission.


Cuba Wadlington, Jr.

SUBSCRIBED AND SWORN TO before me this 8th day of August, 1979.


My Commission Expires August 1, 1981.

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding in accordance with the requirements of Section 1.17 of the Rules of Practice and Procedure.

Dated at Washington, D.C., this 8th day of August, 1979.


Cuba Wadlington, Jr.

COST ESTIMATE FORMAT

INDEX TO EXHIBITS

<u>Exhibit</u>	<u>Description</u>
1	March 1977 Cost Estimate Recast in Work Breakdown Structure Level 2 (1975 Dollars)
2	Summary Comparison of March 1977 Cost Estimate in 1975 and 1980 Dollars
*	<u>Exhibits 3 through 10</u> are details to be developed to support Exhibit 2 Summary
11	Summary Comparison of March 1977 Cost Estimate and Certification Cost Estimate in 1980 Dollars
12	Pipeline - Comparison of March 1977 Cost Estimate and Certification Cost Estimate for WBS Level 2 Pipeline Category (1980 Dollars)
*	<u>Exhibits 12 through 19</u> are details to be developed to support Exhibit 11 Summary
20	Certification Cost Estimate in Work Breakdown Structure Level 2 Cost Categories, 1980 Dollars, by Quarter
21	Certification Cost Estimate in Work Breakdown Structure Level 2 Cost Categories, by Quarter, in Escalated Dollars
*	<u>Exhibits 22 through 29</u> are details to be developed for the six Level 2 WBS Cost Categories
30	Certification Cost Estimate in Summary Inflation Adjustment Categories, 1980 Dollars, by Quarter
*	<u>Exhibits 31 through 39</u> are details to be developed for each of the Special Commodities Summaries in Exhibit 30
33	Permanent Materials - Details of Major Inflation Adjustment Category, 1980 Dollars, by Quarter
40	Summary of Final Design Cost Estimate in Work Breakdown Structure Level 2 Cost Categories, 1981 Dollars and 1980 Dollars
*	<u>Exhibits 41 through 56</u> are details to be developed to support Exhibit 40 Summary
57	Summary Comparison of Certification Cost Estimate and Final Design Cost Estimate in 1980 Dollars

- * Exhibits 58 through 65 are details to be developed to support Exhibit 57 Summary
- 66 Final Design Cost Estimate in Work Breakdown Structure Level 2 Cost Categories, by Quarter, in 1980 Dollars
- 67 Final Design Cost Estimate in Work Breakdown Structure - Level 2 - Cost Categories, by Quarter, in Projected Escalated Dollars (Baseline Cost Tracking Estimate)
- * Exhibits 68 through 75 are details to be developed to support Exhibit 67 Summary
- 76 Final Design Cost Estimate in Summary Inflation Adjustment Categories, 1980 Dollars, by Quarter
- * Exhibits 77 through 85 are details to be developed to support Exhibit 76 Summary
- 82 Construction Machinery and Equipment Major Inflation Adjustment Category, 1980 Dollars, by Quarter

**EXHIBIT 1. MARCH 1977 COST ESTIMATE RECAST IN WORK
BREAKDOWN STRUCTURE LEVEL 2 (1975 DOLLARS)**

		WORK BREAKDOWN STRUCTURE COST CATEGORIES – LEVEL 2								
MARCH 1977 COST ESTIMATE ORIGINAL COST CATEGORY ESTIMATE (\$1,000)		PIPELINE	COMPRESSOR & METERING STATIONS	COMMUN. & SUPERVS. SYSTEM	OPER. & MAINT. FAC.	TEMPORARY FACILITIES & SERVICES	PROJECT MGNT.	CONTG.	AFUDC	TOTALS (\$1,000)
PIPELINE	1,504,000	\$								1,504,000
COMPR./METERING STAS.	211,012		\$							211,012
COMMUNICATIONS	5,000			\$						5,000
GENERAL PLANT	11,324				\$					11,314
SALES TAX	100	\$	\$	\$	\$	\$				100
TEMP. FACILITIES	58,315					\$				58,315
SERVICES & SUPPLIES	51,394					\$				51,394
PROJECT MANAGEMENT	94,391						\$			94,391
INTANGIBLE PLANT	36,000						\$			36,000
CONTINGENCY	88,639							\$		88,639
AFUDC	387,100								\$	387,100
TOTALS	2,445,485									2,445,485

Comment: To recast the March 1977 cost estimate in the format of this approved work breakdown structure, the estimate for each 1977 cost category will be allocated to the appropriate level 2 work breakdown structure cost categories as indicated by \$ in the above matrix. The estimate for each work breakdown structure cost category will then be the sum of the amounts in the column beneath. This will then become the basis for escalating the 1977 estimate to 1980 dollars for comparison with the certification cost estimate.

EXHIBIT 2

Summary Comparison of March 1977 Cost
Estimate in 1975 and 1980 Dollars

<u>Work Breakdown Structure</u> <u>Cost Categories - Level 2</u>	<u>1975 Dollars</u> <u>(\$1,000)</u>	<u>1980 Dollars</u> <u>(\$1,000)</u>	<u>Cost</u> <u>Differential</u> <u>(\$1,000)</u>
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Pipeline

Compressor and Metering Stations

Communication and Supervisory
Systems

Operating and Maintenance
Facilities

Temporary Facilities and
Services

Project Management

Subtotal

Contingency

AFUDC

Total

Comment: This summary exhibit compares the March 1977 cost estimate in 1975 dollars (as filed) and 1980 dollars (1975 dollars escalated to 1980). Supporting Exhibits 3-10 will provide additional detail for each level 2 category, plus contingency and AFUDC, and include a narrative explaining the escalation method employed. Exhibits 2-10 will accompany the FERC filing for a Certificate of Public Convenience and Necessity.

EXHIBIT 11

Summary Comparison of March 1977 Cost Estimate and Certification Cost Estimate in 1980 Dollars

<u>Work Breakdown Structure Cost Categories - Level 2</u>	<u>March 1977 Cost Estimate (\$1,000)</u>	<u>Certification Cost Estimate (\$1,000)</u>	<u>Cost Differential (\$1,000)</u>
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Pipeline

Compressor and Metering Stations

Communication and Supervisory
Systems

Operating and Maintenance
Facilities

Temporary Facilities and
Services

Project Management

Subtotal

Contingency

AFUDC

Total

Comment: This summary exhibit compares the March 1977 cost estimate with the certification cost estimate, both in 1980 dollars and level 2 Work Breakdown Structure cost categories. Supporting Exhibits 12-19 will provide additional detail for each level 2 category, plus Contingency and AFUDC and include a narrative thoroughly explaining all cost differentials. Exhibits 11-19 will enable the commission to determine if the certification cost estimate is unreasonable and materially exceeds the March 1977 estimate. These exhibits will accompany the FERC filing for a Certificate of Public Convenience and Necessity.

EXHIBIT 12

Pipeline - Comparison of March 1977 Cost
Estimate and Certification Cost Estimate for WBS Level 3
Pipeline Category (1980 Dollars)

<u>Work Breakdown Structure</u> <u>Cost Categories - Level 4</u>	<u>March 1977</u> <u>Cost Estimate</u> <u>(\$1,000)</u>	<u>Certification</u> <u>Cost Estimate</u> <u>(\$1,000)</u>	<u>Cost</u> <u>Differential</u> <u>(\$1,000)</u>
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Pipeline - Section No. 1

Civil Construction

Pipeline Construction

Valve Installation

River Crossings

Road Crossings

Alyeska Crossings

Pro-rate Services

Comment: This exhibit is presented as an example of the level of detail to be included in supporting exhibits for FERC's comparison of the March 1977 cost estimate and the certification cost estimate. All supporting exhibits would include a narrative thoroughly explaining cost differentials.

TOTAL - Section No. 1

Pipeline - Section No. 2

Civil Construction

Pipeline Construction

Valve Installation

River Crossings

EXHIBIT 20

Certification Cost Estimate in Work Breakdown Structure Level 2 Cost Categories, 1980 Dollars, by Quarter

Work Breakdown Structure Cost Categories - Level 2	<u>Pre-1980</u>	<u>1980</u>				<u>1981</u>				<u>1982</u>				<u>1983</u>				<u>1984</u>			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Pipeline																					
Compressor and Metering Stations																					
Communication and Supervisory Systems																					
Operating and Maintenance Facilities																					
Temporary Facilities and Service																					
Project Management																					
Subtotal																					
Contingency																					
AFUDC																					
Total																					

Comment: This exhibit is a necessary preliminary step for escalating the certification cost estimate and recasting it in inflation adjustment categories. This estimate will accompany the FERC filing for a Certificate of Public Convenience and Necessity.

EXHIBIT 21

Certification Cost Estimate in Work Breakdown Structure Level 2 Cost Categories, by Quarter, in Escalated Dollars

<u>Work Breakdown Structure</u> <u>Cost Categories - Level 2</u>	<u>Pre-1980</u>	<u>1980</u>				<u>1981</u>				<u>1982</u>				<u>1983</u>				<u>1984</u>			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Pipeline																					
Compressor and Metering Stations																					
Communication and Supervisory Systems																					
Operating and Maintenance Facilities																					
Temporary Facilities and Service																					
Project Management																					
Subtotal																					
Contingency																					
AFUDC																					
Total																					

Comment: This exhibit will provide an estimate of project cash flow based on the certification cost estimate. It will serve as the baseline for cost comparison of actual costs with estimated costs until the acceptance of the final design cost estimate. Supporting Exhibits 22-29 will provide the details of the escalation adjustment method used for the six level 2 WBS cost categories, contingency and AFUDC. Exhibits 21-29 will accompany the FERC filing for a Certificate of Public Convenience and Necessity.

EXHIBIT 30

Certification Cost Estimate in Summary Inflation Adjustment Categories, 1980 Dollars, by Quarter

<u>Summary Inflation</u> <u>Adjustment Categories</u>	<u>Pre-1980</u>	<u>1980</u>				<u>1981</u>				<u>1982</u>				<u>1983</u>				<u>1984</u>			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Labor																					
Line Pipe																					
Permanent Materials																					
Transportation																					
Support Services and Facilities																					
Construction Machinery and Equipment																					
Miscellaneous Consumables																					
Field Data and Land																					
Other																					
Total																					

Comment: This exhibit is prepared on the basis of the certification cost estimate in 1980 dollars, by quarter. Supporting Exhibits 31-39 will present the details for each of the specific commodities in the nine summary categories for which Northwest Alaskan has recommended a specific index. These exhibits will be necessary to implement the inflation adjustment procedures of the IROR. This exhibit will be submitted as a part of the FERC filing for a Certificate of Public Convenience and Necessity.

EXHIBIT 33

Permanent Materials - Details of Major Inflation Adjustment Category, 1980 Dollars, by Quarter

<u>Permanent Materials</u>	<u>Pre-1980</u>	<u>1980</u>				<u>1981</u>				<u>1982</u>				<u>1983</u>				<u>1984</u>			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Gas Turbine Compressor Sets and Auxiliary Equipment																					
Gas Refrigeration Systems and Auxiliary Equipment																					
Generator Sets																					
Supervisory Control and Data Acquisition, Instrumentation and Metering Communications and Other Electrical Equipment																					
Valves, Flanges and Fittings																					
Pipe Insulation and Coating																					
Cement Not Used for Buildings																					
Miscellaneous Fabricated Retail																					
Buildings and Utilidors, Including Building Systems and Other Miscel- laneous Materials																					

Comment: This exhibit is presented as an example of the supporting exhibits which will be submitted to FERC as a basis for implementation of the IROR inflation adjustment procedures.

EXHIBIT 40

Summary of Final Design Cost Estimate in Work Breakdown Structure Level 2 Cost Categories 1981 Dollars and 1980 Dollars

<u>Work Breakdown</u> <u>Cost Categories - Level 2</u>	<u>1981 Dollars</u> <u>(\$1,000)</u>	<u>1980 Dollars</u> <u>(\$1,000)</u>
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Pipeline

Compressor and Metering Stations

Communication and Supervisory
Systems

Operating and Maintenance
Facilities

Temporary Facilities and
Services

Project Management

Subtotal

Contingency

AFUDC

Total

Comment: This summary exhibit compares the final design cost estimate in 1981 and 1980 dollars. The estimate is initially prepared in 1981 dollars, but it must be deflated to 1980 dollars to permit comparison with the certification cost estimate. Supporting Exhibits 41-48 will provide additional detail for each level 2 category, plus Contingency and AFUDC, in 1981 dollars. Supporting Exhibits 49-56 will explain the de-escalation methodology used to obtain 1980 dollars for each level 2 category. These exhibits will be submitted in late 1981.

EXHIBIT 57

Summary Comparison of Certification Cost Estimate and Final Design Cost Estimate in 1980 Dollars

Work Breakdown Structure Cost Categories - Level 2	Certification Cost Estimate (\$1,000)	Final Design Cost Cost Estimate (\$1,000)	Cost Differential (\$1,000)
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Pipeline

Compressor and Metering Stations

Communication and Supervisory
Systems

Operating and Maintenance
Facilities

Temporary Facilities and
Services

Project Management

Subtotal

Contingency

AFUDC

Total

Comment: This summary exhibit compares the certification cost estimate with the final design cost estimate in 1980 dollars. It will be accompanied by a narrative thoroughly explaining all cost differentials, which should be attributable to changes in resource quantities only. Supporting Exhibits 58-65 will provide the details of the final design cost estimate. These exhibits will be submitted in late 1981 when the final design cost estimate is prepared.

EXHIBIT 66

Final Design Cost Estimate in Work Breakdown Structure Level 2 Cost Categories, By Quarter, in 1980 Dollars

<u>Work Breakdown Structure</u>		<u>1980</u>				<u>1981</u>				<u>1982</u>				<u>1983</u>				<u>1984</u>			
<u>Cost Categories - Level 2</u>	<u>Pre-1980</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>

Pipeline

Compressor and Metering Stations

Communication and Supervisory
Systems

Operating and Maintenance
Facilities

Temporary Facilities and Services

Project Management

Subtotal

Contingency

AFUDC

Total

Comment: This exhibit is a necessary preliminary step for escalating the final design cost estimate and recasting the estimate in inflation adjustment categories. This exhibit will be submitted along with the final design cost estimate in late 1981.

EXHIBIT 67

Final Design Cost Estimate in Work Breakdown Structure - Level 2 - Cost Categories, by Quarter, in Projected Escalated Dollars (Baseline Cost Tracking Estimate)

<u>Work Breakdown Structure</u>	<u>Pre-1981</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
<u>Cost Categories - Level 2</u>	<u>1 2 3 4</u>	<u>1 2 3 4</u>	<u>1 2 3 4</u>	<u>1 2 3 4</u>	<u>1 2 3 4</u>

Pipeline

Compressor and Metering Stations

Communication and Supervisory
Systems

Operating and Maintenance
Facilities

Temporary Facilities and Service

Project Management

Comment: This estimate is provided to permit the tracking of actual project expenditures with respect to budgeted project expenditures. This baseline cost tracking is based upon the best available design, and the most recent estimates of resource quantities and prices. Supporting Exhibits 68-75 will provide details for each level 2 category and contingency and AFUDC. These exhibits will be submitted along with the final design cost estimate in late 1981.

Subtotal

Contingency

AFUDC

Total

EXHIBIT 76

Final Design Cost Estimate in Summary Inflation Adjustment Categories, 1980 Dollars, by Quarter

<u>Summary Inflation Adjustment Categories</u>	<u>Pre-1980</u>	<u>1980</u>				<u>1981</u>				<u>1982</u>				<u>1983</u>				<u>1984</u>			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Labor																					
Line Pipe																					
Permanent Materials																					
Transportation																					
Support Services and Facilities																					
Construction Machinery and Equipment																					
Miscellaneous Consumables																					
Field Data and Land																					
Other																					
Total																					

Comment: This exhibit will be prepared using the final design cost estimate in 1980 dollars, by quarter. Supporting Exhibits 77-85 will present the details for each of the specific commodities in the nine summary categories for which Northwest Alaskan has recommended a specific index. These exhibits will be necessary to implement the inflation adjustment procedures of the IROR and will be submitted along with the final design cost estimate in late 1981.

EXHIBIT 82

Construction Machinery and Equipment Major Inflation Adjustment Category, 1980 Dollars, by Quarter

<u>Construction Machinery and Equipment</u>	<u>Pre-1980</u>	<u>1980</u> <u>1 2 3 4</u>	<u>1981</u> <u>1 2 3 4</u>	<u>1982</u> <u>1 2 3 4</u>	<u>1983</u> <u>1 2 3 4</u>	<u>1984</u> <u>1 2 3 4</u>
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Crawler Type Tractors

Transportation Equipment

Other

Comment: This exhibit is presented as an example of the supporting exhibits which will be submitted to FERC as a basis for implementation of the IROR inflation adjustment procedures.

**Proforma
Work Breakdown Structure**

July 27, 1979

**ALASKAN NORTHWEST
NATURAL GAS
TRANSPORTATION COMPANY**

TABLE OF CONTENTS

SECTION	PAGE
<u>Introduction</u>	1
Background and Philosophy	1
Definition	1
Purpose	2
<u>Development</u>	4
Project Summary Work Breakdown Structure	4
Contract Work Breakdown Structure	5
Organizational Concepts Within CWBS	7
Project Work Breakdown Structure	8
<u>Applications</u>	11
Project Code of Accounts	11
Estimating	11
Scheduling	12
Budgeting	12
Evaluation and Reporting	13
<u>Summary</u>	14
<u>References</u>	15

EXHIBITS

<u>Item</u>	<u>Page</u>
Figure 1: Project/Organization Integration . . .	10
Attachment 1: Project Summary Work Breakdown Structure	16
Attachment 2: Typical Pipeline Construction WBS . .	17
Attachment 3: Typical Pipeline Engineering WBS . .	18
Attachment 4: Typical Compressor Station Construction WBS	19
Attachment 5: Typical Compressor Station Engineering WBS	19
Attachment 6: WBS for Typical Operating and Maintenance Facility	21
Attachment 7: Sample Project Management WBS	22
Attachment 8: WBS Tabular List of Elements	23

WORK BREAKDOWN STRUCTURE

Introduction

Background and Philosophy

In presenting a recommendation on Work Breakdown Structure (WBS)* for the Alaskan segment of the Alaskan Natural Gas Transportation System (ANGTS) Project, Northwest Alaskan Pipeline Company (Northwest) has worked in conjunction with Fluor Engineers and Constructors to develop a straight-forward and comprehensive approach to WBS. While realizing that our Project is but one segment of the entire ANGTS Project, we believe it is essential to address this segment's unique characteristics such as construction environment (Arctic and Sub-Arctic) and Project Management approach (utilizing a Project Management Contractor) when developing control systems criteria and, specifically in this instance, WBS definition. Northwest concurs with the control philosophy of a WBS on the ANGTS Project and offers this discussion and preliminary study as our recommendations for the Alaskan segment WBS.

Definition

The starting point of our WBS development was the definition of our understanding of the WBS concept. Within a control system, a WBS is a product oriented "family tree" which defines, organizes, and identifies

*Recommendation of a WBS, a term normally associated with Performance Measurement System (PMS) control criteria, is not intended to infer the recommendation of PMS criteria. The WBS, as a specific control criteria, is being recommended for use as a component part of an overall control system currently under development.

the various work efforts required to accomplish the objectives of a contract/agreement or, in this case, an entire project. This "family tree" is graphically represented as a hierarchical breakdown of the project from the highest level of the WBS (the total project) to the lowest level (detailed tasks required to meet the project objective). The WBS serves project management needs by providing the structure in accordance with the way the work is to be performed and by reflecting the way in which project costs and data will be summarized and reported for the purpose of control.

A common misconception is the representation of a WBS as a project organizational chart. The WBS does not represent the organizational structure but, rather, provides the means for assigning organizational responsibility to specific work elements or tasks. (This aspect of WBS is discussed in further detail later in this paper.)

For the purposes of this paper, we will confine our discussion of WBS levels to those levels directly applicable to the Alaskan segment. As such, we recognize that above our highest level (level 1) there is at least one additional level which accumulates the various segments of the ANGTS project.

Purpose

The magnitude of the Alaskan project segment dictates the need for an efficient and responsive Project Management system. This system is to be structured in a way which will serve the needs of the Government, the Project Sponsors, the Financial Community, the Project Management Contractor, and the Execution Contractors. As a component of an overall control system, the WBS provides the basis and common framework for

scheduling, estimating, costing, and monitoring the status of the Project and considers in its structure the requirements of each of these areas. It permits assignment of responsibility, delineates objectives for monitoring costs and progress, and provides a basis for uniform planning and control.

From the WBS, information will be assembled and reported in several diverse formats to satisfy individual needs of the FERC, the financial community, the Project Sponsors, and others. Base data accumulation will identify with specific capitalized facilities wherever possible and thus will provide the accounting and management methodology necessary to fulfill the reporting requirements of the Alaskan segment.

In summary, the WBS as proposed will provide the foundation for data accumulation which will readily relate to construction philosophy and will meet the reporting needs of the Project in a consistent and reliable manner.

Development

Project Summary Work Breakdown Structure

The development of the WBS requires Project Management, in this case the Project Sponsors as represented by Northwest, to identify the major objectives and subobjectives of the project. This development is referred to as the Project Summary Work Breakdown Structure (PSWBS) and encompasses the first two levels of the WBS. The preliminary version of this PSWBS, shown on attachment 1, is used by Northwest to identify work for supporting contracts and/or organizations on the Project. The highest level product is designated as level 1 and represents the summarization of all data to the total "Alaskan Segment" of the ANGTS Project. Level 2 has been developed to segregate permanent facilities and Project Management cost centers. This reflects the manner in which Northwest requires summary data accumulation to meet the reporting requirements of the Project. Being the final level of the PSWBS, level 2 also sets forth the major segments of the Project in similar fashion to the manner in which the work is to be executed.

While it is apparent that a straightforward approach has been taken in the proposed PSWBS, changes in contracting strategies or project philosophy could require modification. It is important, therefore, to remember that in all cases the WBS process is iterative. The WBS is not intended to be rigid and may be modified, if deemed necessary. If alternatives are found to provide a better means toward achieving the Project objectives, the PSWBS should be revised accordingly.

Contract Work Breakdown
Structure

The PSWBS serves as the source for selection and application of appropriate WBS elements to the various end products of the Project (i.e., Pipeline Facilities, Compressor and Metering Stations, Project Management, etc.). The Project Management Contractor (PMC) is responsible for further development of the WBS by dividing the PSWBS elements into manageable units of work as defined through the evaluation of specific contract objectives, construction/work plans, and Northwest control and reporting requirements. The resulting structure, referred to as a Contract Work Breakdown Structure (CWBS), will be prepared for all PSWBS level 2 elements to set out the full structure of the Project.

The CWBS must reflect precisely how the work is to be performed and also represent the manner in which the work will be organized, managed, and reported. Prospective contractors on the Project will receive this CWBS as a part of the bid package and will evaluate its application to their specific work plans. The contractor must have the flexibility to modify and/or extend the CWBS to reflect his specific work plans; however, such modifications will be subject to review and approval by Northwest for compliance with control philosophy and procedures. Particular attention will be paid by Northwest and the PMC to ensure the correlation of lower level CWBS elements to work statement tasks, contract line items, configuration items, etc. to provide data accumulation in line with specific reporting requirements of the project.

Development of the CWBS's is critical to the effective application of control and performance measurement criteria. Traceability and

auditability of data is required throughout the CWBS to ensure validity and proper categorization of Project data.

The CWBS shown in attachments 2, 3, 4, 5, and 6 sets out typically proposed contract work breakdowns for pipeline, compressor and meter station, and operating and maintenance facility. These samples define the third through sixth levels.

At WBS level 3, the major PSWBS level 2 element is subdivided into each specific facility (i.e., compressor station 1, pipeline section 1, etc.) within that category. At this level cross comparisons can be made within each category to evaluate performance of like facilities on this level. This will also correspond to the contractor's summary level of work breakdown and will probably be designated as the management reporting level to Northwest by way of the PMC.

Level 4 of the WBS will further break each facility into construction disciplines. At this level control data can be identified on the basis of specific facility objectives or units. This level is considered an intermediate control level for the contractor and is one in which a general review of work performance can be made.

Level 5 further subdivides the work to indicate the specific disciplines or crews such as pipe stringing, excavation, backfill, etc., for pipeline construction, or building erection, station piping, foundations, etc., for station construction and so on. This level is considered the primary control level for the construction contractor. At this level, the contractor can review the detailed work activities of the facility to determine progress, performance, and cost effectiveness. It is also at this level where all cost elements (labor, materials, equipment etc.) first accumulate to a work activity. This level will

provide the basis of identification of property retirement unit costs and the source of data to be accumulated to the FERC Uniform System of Accounts (U.S.O.A.).

Level 6 contains the full detail of cost elements by activity. It is not anticipated to compile reports based on level 6 for the Project; instead, this will be the base data level at which all information is input. This level will provide the detailed information to justify and support the performance of specific work activities relative to productivity, inflation impacts, and work scope deviation. In addition, construction contractors would utilize this level to research activity overruns to determine the source and composition of the problem for their internal control purposes.

The development of CWBS's utilized on this project will be an incremental process evolving as scope and definition improve. It is anticipated that full development of the project management CWBS will noticeably lag those developed for construction operations.

Organizational Concepts

Within WBS

The integration of a CWBS and an organizational structure for a specific portion of the Project will be developed by the contractor responsible for that portion. Within the CWBS the contractor has the flexibility to designate the appropriate level at which his organization interfaces with the CWBS elements to establish points of responsibility. The flexibility to establish these interfaces at meaningful levels will ensure the compatibility of the contractor's existing management systems and techniques with the control criteria defined by Northwest.

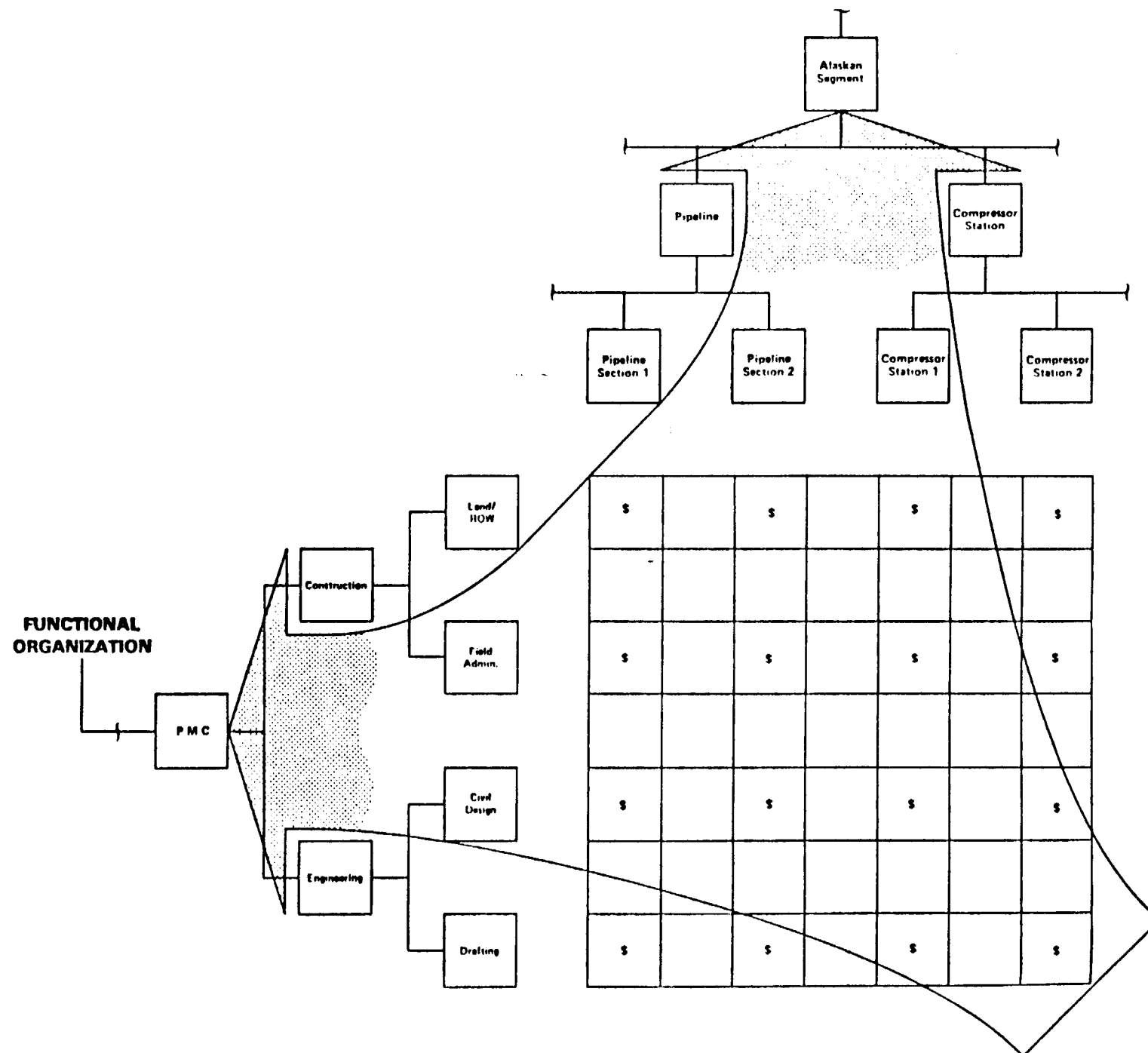
As stated earlier, a WBS is not a project organizational chart. The WBS defines the specific scope of work and detailed work elements of the Project while an organizational structure assigns responsibility to defined levels of work through a matrix integration of the two structures (see Figure 1, Page 9).

The level at which organizational responsibility has been assigned is referred to as the control account level and will be the focal point of cost/schedule planning and control. It is anticipated that the control account levels on this Project will generally coincide with WBS level 6, though it is realized that control level requirements may differ from contract to contract.

Project Work Breakdown Structure

The final Project Work Breakdown Structure is the result of the combination of the final PSWBS and the approved CWBS's for all supporting contracts. The Project WBS will not be finalized until such time as all contractors have approved CWBS's. In the interim period, the Project WBS will be developed as necessary to provide a basis for Project planning including estimating, scheduling, and contract preparation. This development will include the tabular listing of WBS elements in a format similar to that shown on attachment 8. Further WBS definition is then provided through the development of narratives for each WBS element to define specific work scope, resource requirements, and other information necessary to represent the individual character of each.

WORK BREAKDOWN STRUCTURE



Upon approval by Northwest, the Project WBS together with appropriate WBS narratives will be issued for publication. This document will be changed and revised as necessary to maintain the traceability of all Project work efforts.

Applications

Project Code of Accounts

The development of a Code of Accounts (COA) for the Project will draw from the information displayed in the WBS to provide the vehicle through which all project control data is input, categorized, and reported. The use of the WBS will serve to simplify the structure of the COA to provide a more comprehensive control mechanism. The COA will provide the basis for data identification and sorting as may be required outside of the structure of the WBS and for the identification of resources associated with taxes, freight, contingency, AFUDC, scope changes, and other similar categories. The COA will, therefore, effect the implementation of scope change, inflation adjustment, and audit procedures by providing specific identification of resources to the proper account (i.e., specific scope change, inflation adjustment category, FERC Uniform System of Accounts) for reporting to Northwest, the Federal Inspector, the FERC, and the financial community. (Further discussion of the function and use of a COA will be addressed in a separate paper.)

Estimating

The WBS assists the development of all project estimates by providing a uniform basis for identification and allocation of required resources. It will also serve to ensure the inclusion of all relevant project costs and their subsequent roll-up into required project structures. Evaluation and comparison will be made of the estimate at select

levels of WBS detail to ensure validity and uniformity of costs. Such comparisons will also provide the Federal Inspector and the FERC with the information necessary to fulfill the "reasonableness" review of project estimates as required by the President's Decision.

The integration of project estimates with project schedules will produce a time-phased estimate by WBS element to establish cash flow requirements and to provide an assessment of escalation/inflation impacts on the Project.

Scheduling

The WBS establishes a framework for the assembly and display of schedule data by WBS element to effectively delineate the Project schedule. Use of a common WBS will ensure the uniformity and compatibility of schedule data with other project information (i.e., cost estimates, budgets) to provide an orderly approach to control data assessment and evaluation and will permit the implementation of an integrated cost/schedule control system.

Assessment and evaluation on a project-wide basis will be made through the accumulation of regular schedule status and analysis by WBS control element for each contractor on the Project.

Budgeting

Upon approval by Northwest, the Federal Inspector, and the FERC, the estimate of resources required for each WBS element will be implemented as the control base or budget for the Project. As such, it will become the basis for the accounting, tracking, and reporting of costs

throughout the project life. As a budget, the only allowable modifications will be those made by change order in accordance with approved scope change procedures.

The integration of the budget and schedules for the Project will provide a cash flow plan to be used as the basis for financial planning on a short- and long-term basis. Continuity of budget elements and cash flow plans will be maintained through the application of the WBS.

Evaluation and Reporting

Since the WBS represents the manner in which the work is to be performed, it will provide the format required for evaluation and control of the Project. Previous sections have addressed estimating, budgeting, and scheduling; all of which represent execution plans. As actual execution data is received it will be contrasted with the appropriate plans at select WBS control levels for the purposes of cost tracking, performance measurement, and evaluation.

Reports and evaluations made at the contractor reporting level will be presented to project management to represent the current project status. From such reports and evaluations, management decisions will be made to modify the work plans as necessary to minimize the impact of negative performance variances. External reports necessary to meet the needs of the Federal Inspector, the FERC, and the financial community and to satisfy the probable conditions imposed by the IROR will be derived from the WBS through the manipulation and formatting of base data information.

Summary

The approach taken by Northwest to the issue of WBS is felt to be the most effective way to manage and control the performance of the Project. While it may be that other segments of the ANGTS Project may view their requirements differently and may arrive at a different philosophy and structure for their respective WBS, we feel it is essential to the success of the Alaskan segment to have the latitude to develop and implement a WBS which best serves our needs. Though it is premature to present a finalized WBS for the Project, we have presented our views on the WBS issue and structures which are felt to best represent those views.

References

1. DOE Performance Measurement System Manuals Numbers DOD/ET-0050/2 through DOE/ET-0050/7 Reprints, April 1978.
2. DOE Uniform Contractor Reporting System Guidelines Volume 1, DOE/CR-0001/2, September 1978.
3. Work Breakdown Structure for the Northwest Project, Frank Moolin and Associates, Inc., April 20, 1978.
4. I.D.A. Proposed Work Breakdown Structure - Alaskan Segment, Mr. J. D. McCullough, October 6, 1978.

NOTE: ALL INFORMATION SHOWN AT LEVEL 3 & BELOW IS PRELIMINARY AND IS SHOWN HERE FOR REFERENCE ONLY.

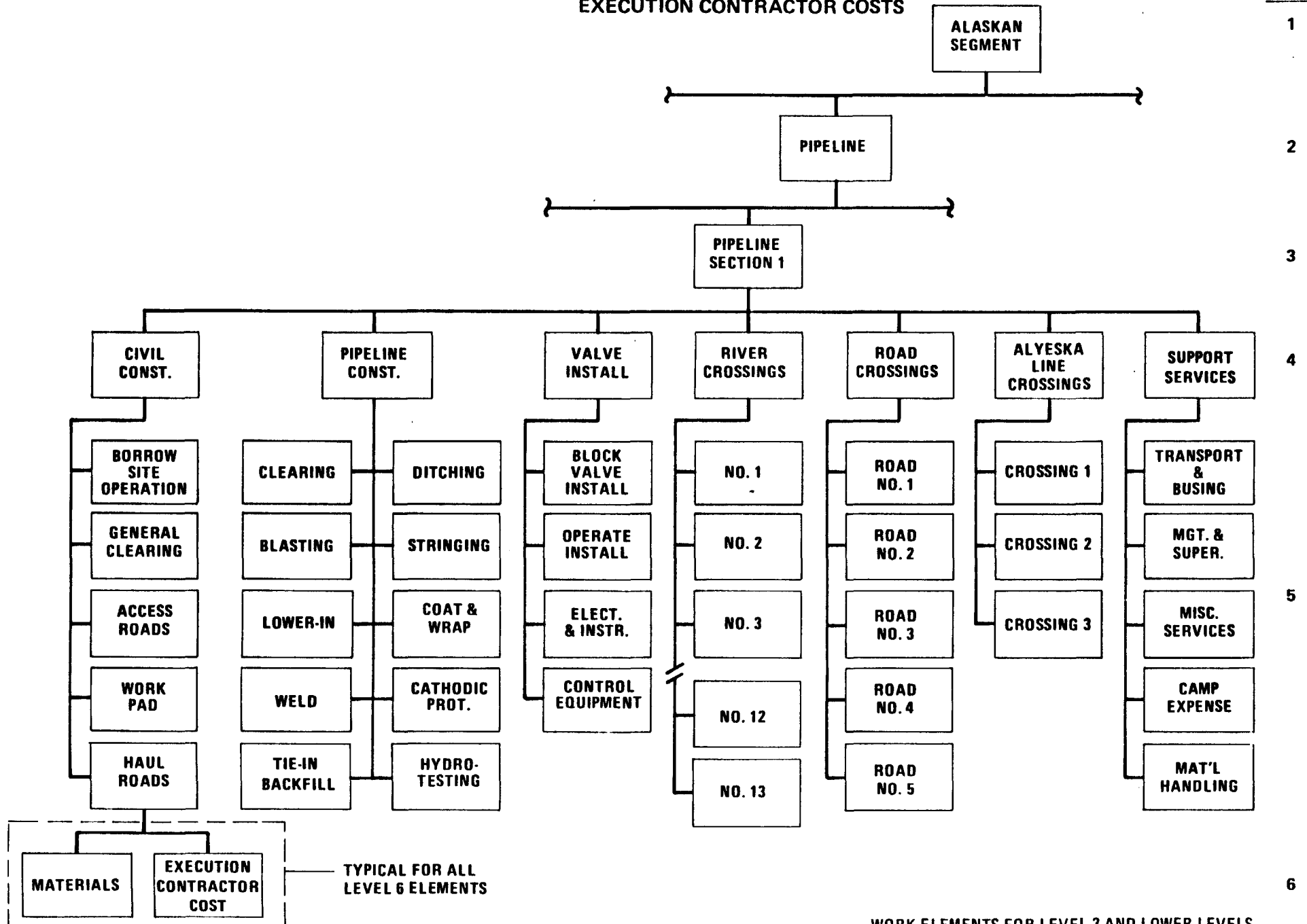


**WORK ELEMENTS FOR LEVEL 3 AND LOWER LEVELS
ARE TYPICAL ONLY.**

SAMPLE WBS FOR PIPELINE MATERIAL COSTS & EXECUTION CONTRACTOR COSTS

Attachment 2
Page 17

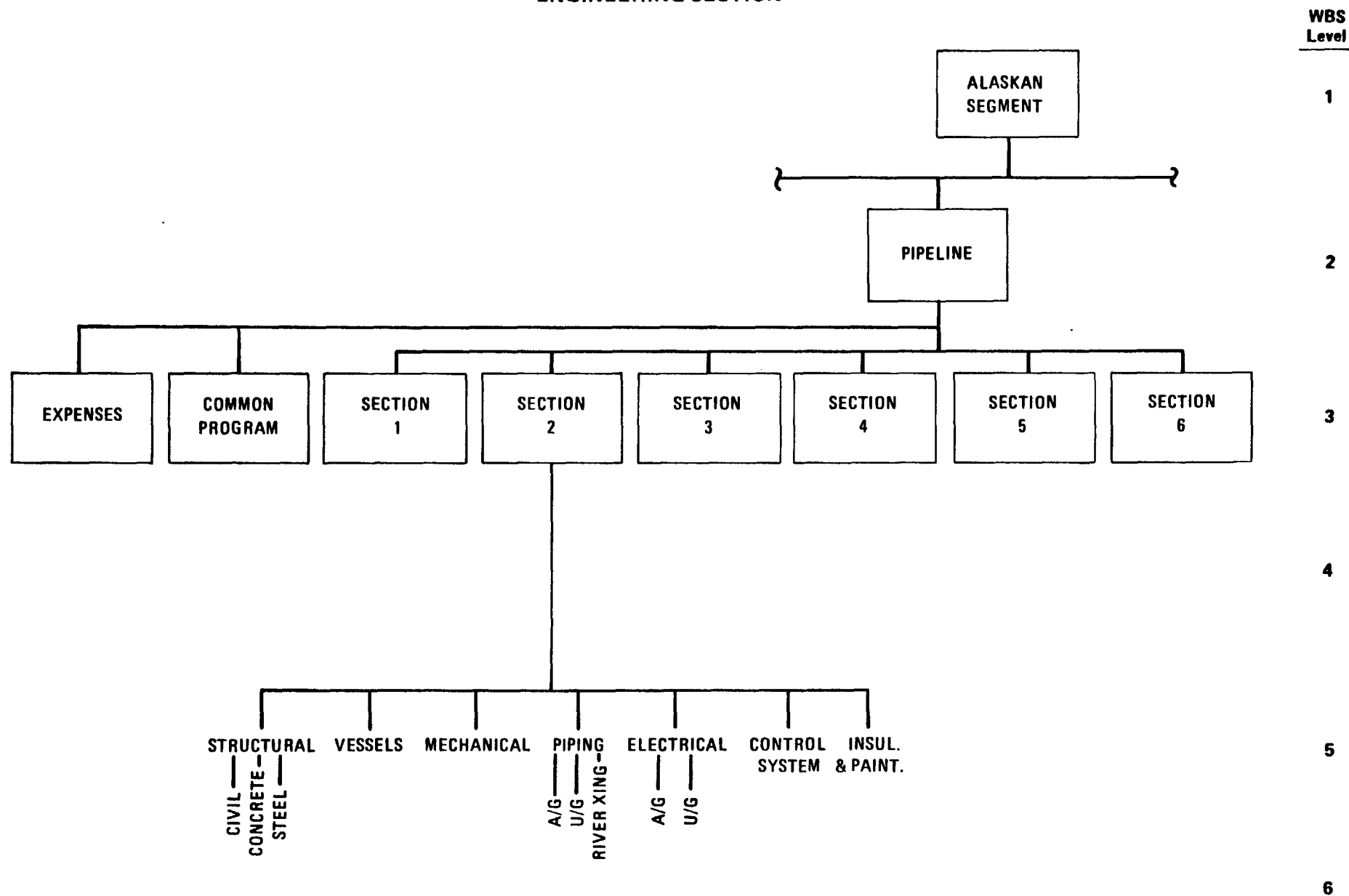
WBS
Level



* WBS LEVELS 5 & 6 MAY NOT BE UNIVERSAL FOR ALL TYPES OF CONTRACTS.

WORK ELEMENTS FOR LEVEL 3 AND LOWER LEVELS
ARE TYPICAL ONLY.

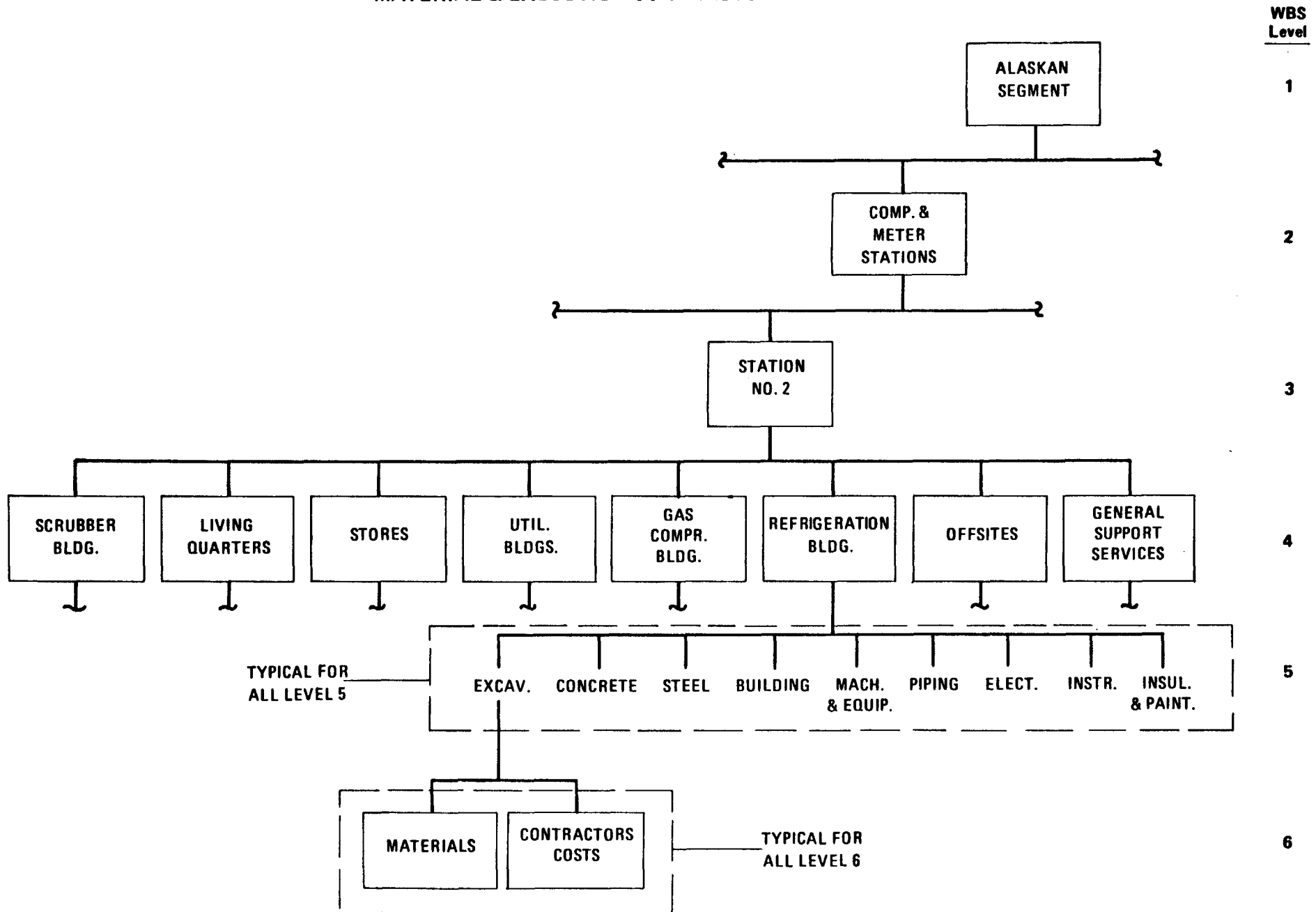
SAMPLE WBS FOR A TYPICAL PIPELINE ENGINEERING SECTION



WORK ELEMENTS FOR LEVEL 3 AND LOWER LEVELS
ARE TYPICAL ONLY.

**SAMPLE WBS FOR A TYPICAL COMPRESSOR STATION
MATERIAL & EXECUTION CONTRACTOR COSTS**

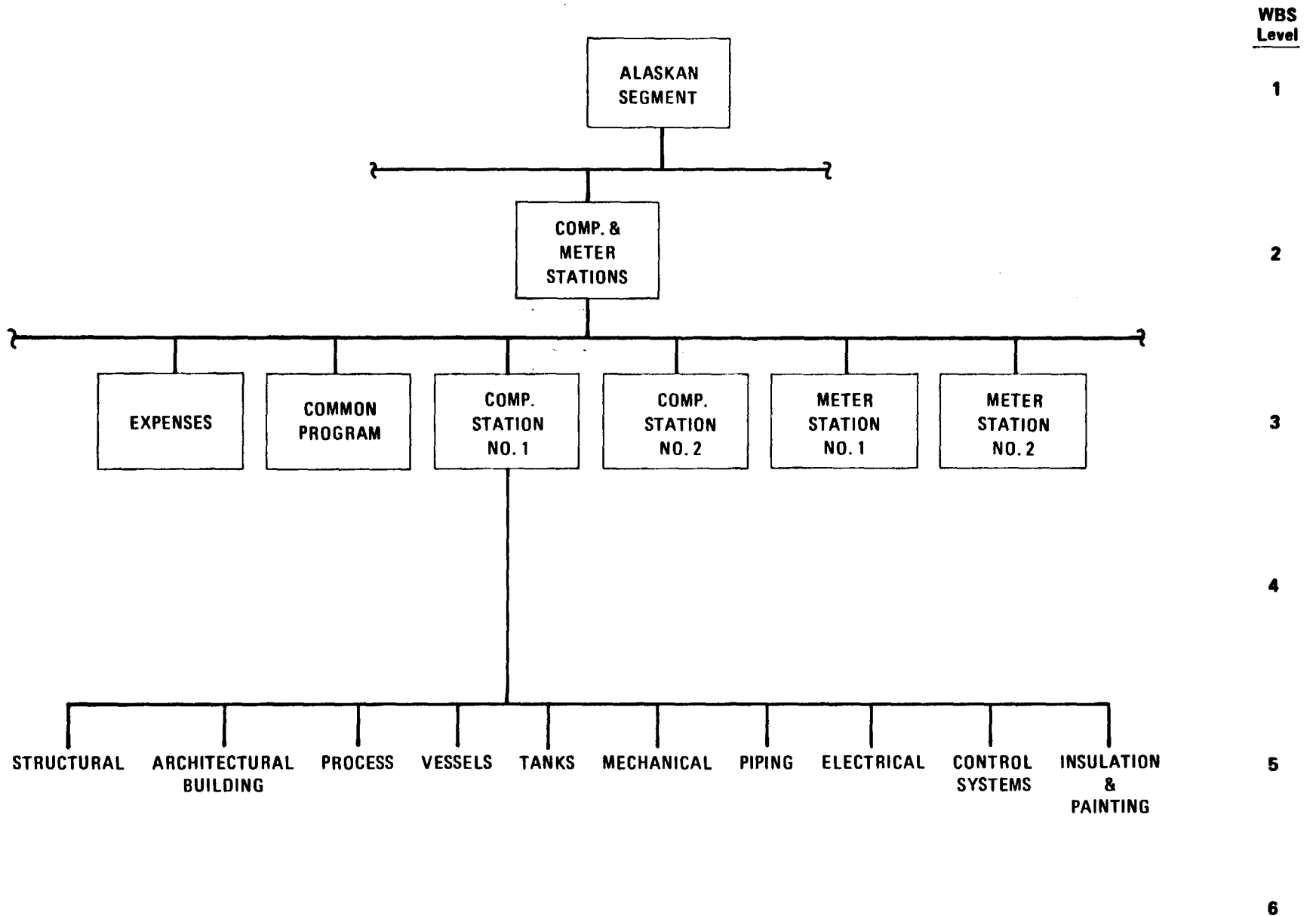
Attachment 4
Page 19



* WBS LEVEL 5 & 6 MAY NOT BE UNIVERSAL FOR ALL TYPES OF CONTRACTS.

WORK ELEMENTS FOR LEVEL 3 AND LOWER LEVELS
ARE TYPICAL ONLY.

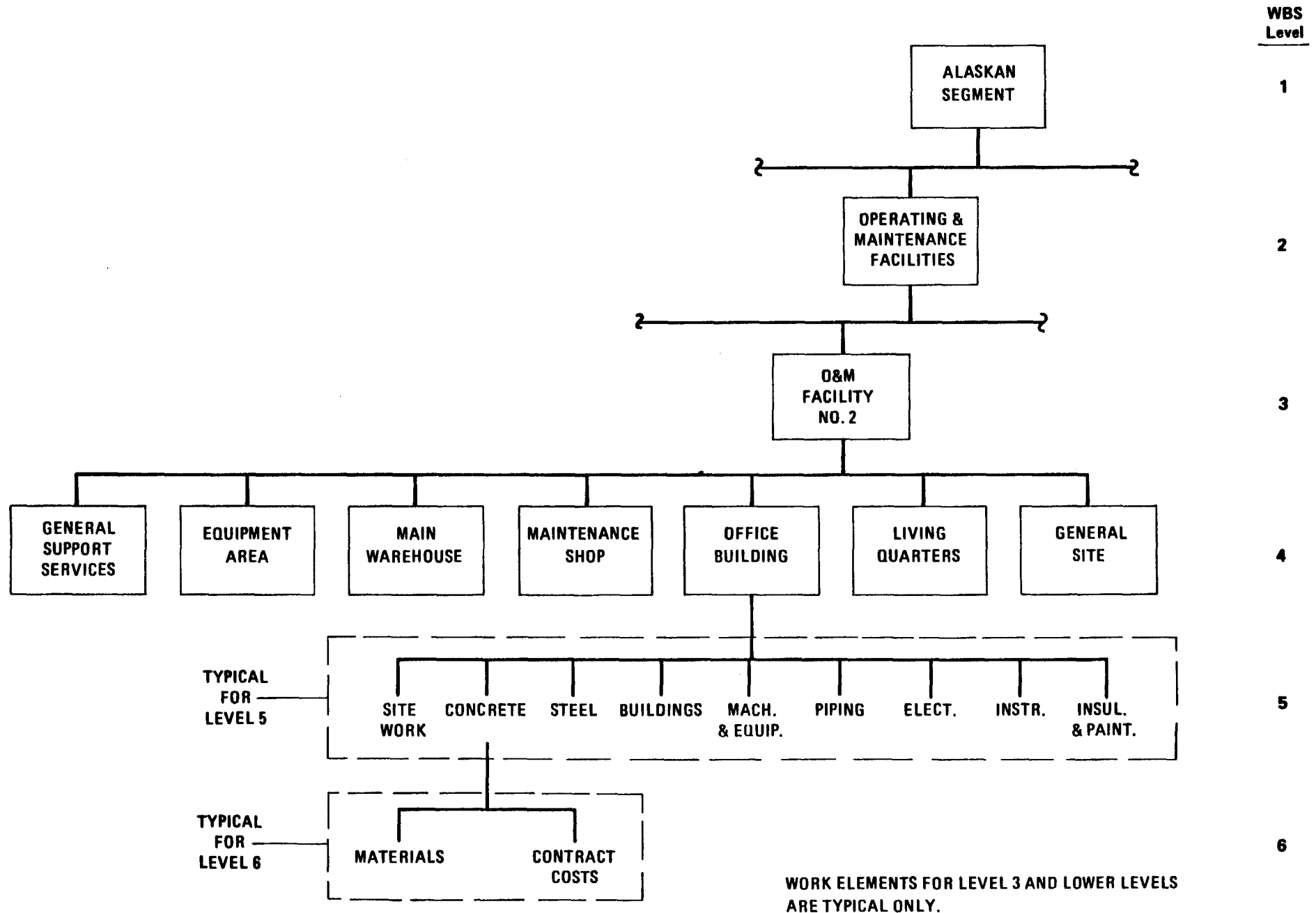
SAMPLE WBS FOR A TYPICAL COMPRESSOR STATION ENGINEERING COSTS



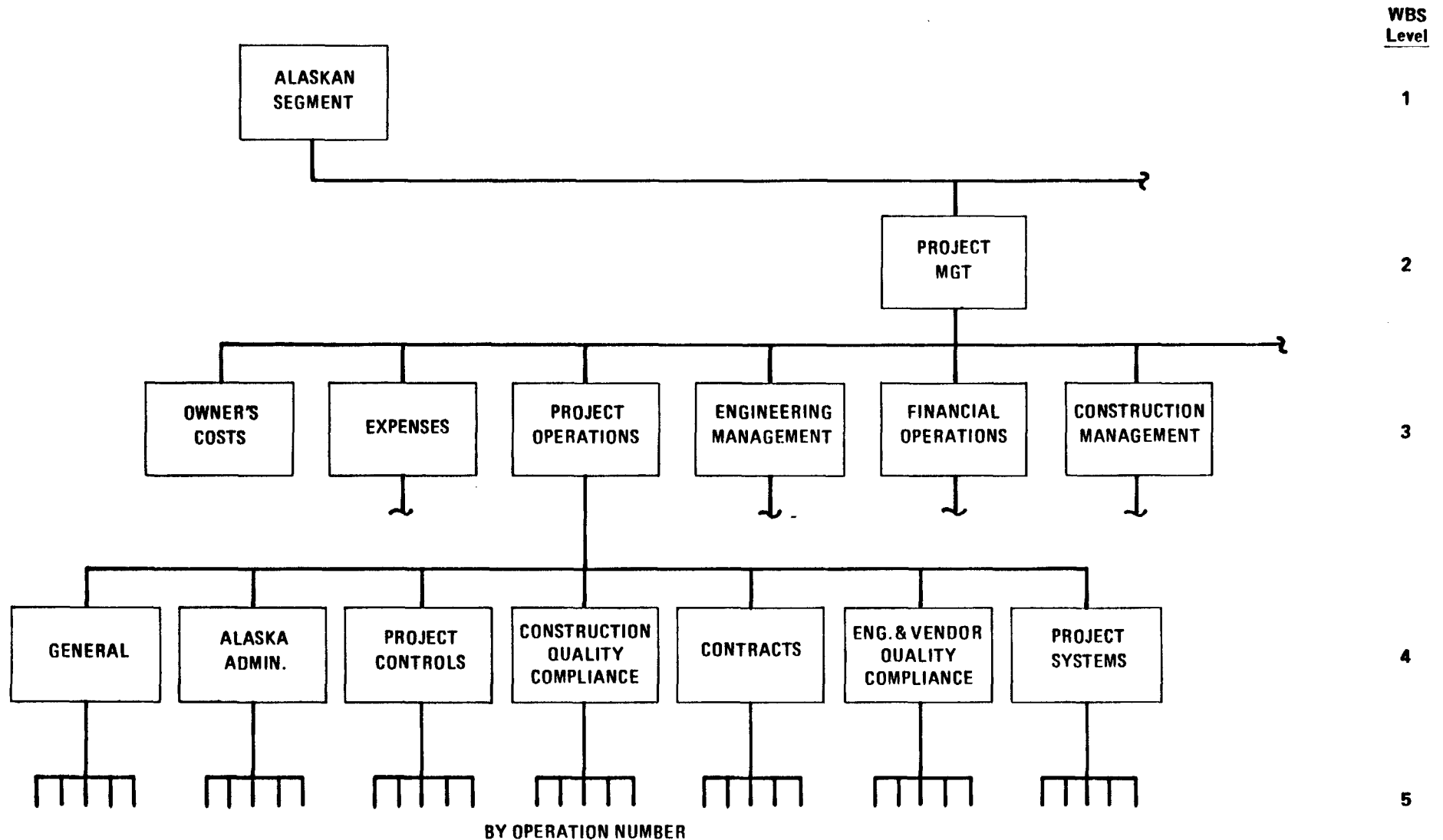
WORK ELEMENTS FOR LEVEL 3 AND LOWER LEVELS
ARE TYPICAL ONLY.

**SAMPLE WBS FOR A TYPICAL
OPERATING & MAINTENANCE FACILITY
MATERIAL & EXECUTION CONTRACTORS COSTS**

Attachment 6
Page 21



**SAMPLE OF WBS
FOR PROJECT MANAGEMENT COSTS**



WORK ELEMENTS FOR LEVEL 3 AND LOWER LEVELS
ARE TYPICAL ONLY.

**WORK BREAKDOWN STRUCTURE
TABULAR LIST OF ELEMENTS**

WBS LEVEL					
1	2	3	4	5	6
	Alaskan Segment				
	Pipeline Facilities				
	Pipeline Section 1				
			Civil Construction		
				Borrow Site Operation	
					Material Costs
					Contractor Costs
				Access Roads	
					Material Costs
					Contractor Costs
				General Clearing	
					Material Costs
					Contractor Costs
				Work Pad Construction	
					Material Costs
					Contractor Costs
				Haul Roads	
					Material Costs
					Contractor Costs
			Pipeline Construction		
				Clearing	
					Material Costs
					Contractor Costs