 state of utah

DIVISION OF WILDLIFE RESOURCES

EQUAL OPPORTUNITY EMPLOYER
DOUGLAS F. DAY
Director
1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

August 27, 1980

Reply To SOUTHEASTERN REGIONAL OFFICE
455 West Railroad Avenue, Box 840, Price, Utah 84501
(801) 637-3310

RECEIVED
SEP 15 '80
EUREKA ENERGY CO.
Salt Lake City

Mr. David Hess, Vice-President
and General Manager
Eureka Energy Company
215 Market Street, Room 258
San Francisco, California 94106

Dear Mr. Hess:

Development of Eureka Energy Company's Sage Point-Dugout Canyon Mining Project requires a determination of corridors for deer movement and their intensity of use in relation to a planned overland coal conveyer. The planned conveyer, which extends over a distance of nearly nine kilometers from Fish Creek and Dugout Canyon portals to the coal preparation and handling area, bisects high value winter range for mule deer. If not properly planned the conveyer would represent a barrier to migration movements of deer. Original field study has resulted in preparation of the following report. This study is intended to satisfy part 2a in Appendix G of the study proposal to determine the "Effects of Coal Development on Wildlife in Southeastern Utah." This information will assist Eureka Energy Company in an application for a coal mining and reclamation permit.

The primary objective of this study was to determine at which points along the planned conveyer that crossing structures for mule deer need to be developed. Crossing structures, if properly placed, will result in avoidance of impacts to the migration of mule deer between summer and winter ranges and daily use of their high-priority and crucial-critical winter ranges.

The proposed conveyer route was monitored from December 9, 1979 through May 23, 1980. Track count data and evidence of trails were collected once each week during January, February, March and April, and bi-weekly during May. Conveyer belt sections (sections are lengths identified between transfer points as per figure 1) 3, 4, 5, 6, 7, 8, 9, and 11 were monitored from an on-the-ground survey. These sections were divided up into 100 meter increments for data collection purposes. In addition, all sections of the conveyer belt (sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11) were monitored at random intervals from the air with the objective of determining major deer trails that approached the conveyer alignment and evidence of concentrated deer use on the project area in relation to the conveyer.

Observations made from the aircraft were utilized to confirm and support movement data collected from on-the-ground surveys. Aerial surveys were not utilized to count mule deer on the project area. Such counts are only suited for determination of demographic trends within a deer herd.

Analysis of the data (numbers of tracks or trails) represented a perusal analysis of numerical associations. Comparisons of conveyer lengths by statistical methods are not needed since the objective is to select passage points for deer. Determination of sample means $\left(\bar{X} = \frac{\Sigma X}{N}\right)$, standard deviation $\left(\sigma = \sqrt{\frac{\Sigma X^2}{N} - \left(\frac{\Sigma X}{N}\right)^2}\right)$, standard error $\left(S\bar{y} = \frac{\sigma}{\sqrt{N}}\right)$ and confidence intervals $\left(CI = \bar{X} \pm S\bar{y}\right.$ (Tabular value for the distribution of "t"$\left.\right)$ -- two-tailed test as per a selected level of probability--

were as follows: x equals the number of tracks or trails observed in any sample period; N equals the number of sample periods; and tabular values for the distribution of "t" are those identified in G. W. Snedecor and W. G. Cocian. 1967. Statistical Methods. Iowa State University Press, Ames, Iowa. 593 p. Note, that the degrees of freedom utilized represented infinity rather than (N-1).

For purposes of definition a trail was documented when too many deer tracks crossed in either direction of the conveyer route at a given point, thus eliminating the biologist's ability to accurately discern numbers of individual deer. A track represented passage in either direction over the conveyer route by a deer.

In almost all cases trails represented daily or at the most weekly travel corridors. The few trails that showed regular use by deer throughout the winter are identified on figure 2. These permanent trails are associated with geologic features of the landscape and preferred travel corridors to agricultural plots and watering areas. It was observed and expected that most trails would regularly change in location dependent upon changing snow depths and day to day movement of deer within the winter range. Therefore, recommendations will reflect the numbers of crossing structures for deer needed within various 100 meter segments of a given conveyer section.

The conveyer route that was monitored from on-the-ground investigations had been surveyed and marked for purposes of this study by Eureka Energy Company. The Company also provided topographic maps (figure 2) showing their preferred alignment. It is important to note that the preferred alignment depicted in figure 2 is not the same as the alignment surveyed on the ground. This is not a particular problem, since both alignments are proximal to each other. The aerial surveys allowed for a corridor evaluation. Therefore, data collected is specific to the surveyed, on-the-ground alignment. Recommendations, however, reflect an extrapolation of the field data to the preferred alignment in figure 2 or generally to any alignment lying proximal to the measured route.

A total of 5,358 tracks and 660 trails were monitored during 22 different on-the-ground sample periods (Tables 1, 2 and 3 and Appendix A). Additionally, seven aerial flights were made for data collection and verification purposes (Appendix B). Three distinct levels of use by mule deer (tracks and/or trails) can be seen by perusal analysis of figures 3 and 4--highest intensity of use, conveyer section 9; the second highest intensity of use, conveyer sections 5, 7, 8 and 11; and the third highest intensity of use, conveyer sections 3, 4 and 6. Evaluation of the aerial survey data (Appendix B) and the data presented in Tables 3 and 4--Note, Tables 3 and 4 represent a summary of Appendix A--showed a fourth and the lowest level of use in conveyer sections 1, 2 and 10.

Appendix C provides a detailed discussion of observed deer use within each conveyer section. It is recommended that within Fish Creek and Dugout Canyons (conveyer sections 1, 2 and 10) that the conveyer be designed or modified with fence so that it will be a barrier to movement by deer. Then, at selected points passage structures should be developed and equipped with gates that can be maintained closed for fall migration and opened for spring migration. This will provide mitigation for accidental vehicle-deer collisions within the canyons. Blockage of the passages during the fall migration will reduce the numbers of deer frequenting the roadway in the bottom of either canyon. The open passages for spring migration will facilitate an escapeway so that deer wandering down the road or those that may be surprised on the road by vehicle traffic can pass under the conveyer on their way to summer range. To enhance this planned mitigation the conveyer should be constructed immediately adjacent to the portal access roads within either canyon.

It is recommended that section 1 have three evenly spaced passage structures. Conveyer section 2 will require two passage structures within the canyon and beyond the point where the conveyer crosses the road. Conveyer section 10 will need three evenly spaced passage structures and one additional passage point to be located at the vertex of sections 10 and 11 so that entrapment of deer can be prevented (figure 2).

It is recommended that conveyer section 3 have six evenly spaced passage structures. Conveyer section 4 will require six evenly spaced passage structures and one additional passage point that will allow deer use of the top banks either side of the wash it crosses in NE 1/4 Sec. 28, T. 13 S., R. 12 E. Conveyer section 6 will need three evenly spaced passage structures and one additional passage point where the conveyer will cross the upper part of the west facing slope on Fish Creek Ridge (figure 2).

It is recommended that conveyer sections 5 and 7 respectively have seventeen and eighteen evenly spaced crossing structures. Conveyer section 11 will need twenty-three evenly spaced crossing structures. It will be important that design of the conveyer be such that deer will have freedom of use along the top banks either side of Corbola (conveyer sections 5 and 11) and Fish Creek Washes (conveyer section 7) at the points where the conveyer approaches or crosses those drainages. Conveyer section 8 will need fifteen evenly spaced crossing structures (figure 2).

It is recommended that conveyer section 9 be elevated to allow at least three meters clearance between the ground and bottom of the conveyer, due to the intense, winter-long use by deer in this area. An alternative would be to provide thirty evenly spaced passage structures along this section. Either method would adequately provide for permanent trails located within the first 400 meters of conveyer as you proceed from the northwest toward the southeast (figure 2).

Generally speaking overpass and underpass type structures are recommended in order to allow passage of mule deer to habitats either side of any conveyer alignment. These crossings should be placed at the points identified on figure 2 if the preferred alignment is ultimately developed. If an alternative alignment for the conveyer is selected the number of crossings must be the same per conveyer section as identified for the preferred alignment. A decision concerning the point for placement of some strategic crossing structures on alternative alignments must ultimately be made from a field inspection once a permanent route is selected. The specific point for most crossings is negotiable as long as the spacing between crossing per conveyer section remains rather constant; note the recommended number of crossings per conveyer section is important and must be satisfied.

Underpasses should have a minimum height of three meters maintained across a conveyer span of at least five meters. Overpasses should be designed as a circular earthen ramp with the conveyer bisecting the ramp into two equal halves as follows:

On either side of the conveyer a half-round ramp with a slope no greater than 3:1 on a five meters wide patch placed at an angle 90 degrees to the conveyer and tapering around to a slope of 5:1 at paths adjacent and parallel to the conveyer. The platform over the conveyer should be concrete or some other material that would not echo when being crossed by deer and should be of character similar to rock or natural earth.

Soils associated with either crossing style should be of the A and B horizons to allow for development of vegetation. Vegetative cover must be established in association with all crossing sites in order to lessen anxiety of individual deer through development of a natural appearing environment. Mature pinyon or juniper trees and an abundance of browse plants need to be placed proximal to crossing points in order to provide a safe travelway for deer. The browse plants will also serve as a permanent attraction for deer to crossing points. Additionally, a mixture of grass and forb seeds should be broadcast over each crossing point to stabilize the soil and enhance the forage situation. Appropriately sized boulders may need to be placed at crossing sites in order to control off-road-vehicles utilized by outdoor recreators.

It is hoped that this information will prove to be beneficial to the Company's goals. Without doubt achievement of recommendations provided within this report will avoid and/or mitigate impacts that could result from the planned overland conveyer.

Thank you for the consideration that has been given to Utah's wildlife resource.

Sincerely,

Larry J. Wilson, Supervisor
Southeastern Region

LJW:LBD:hm

Encls.

cc: Darrell Nish
Clea Chidester
Paul Anderson
Leon Berggren

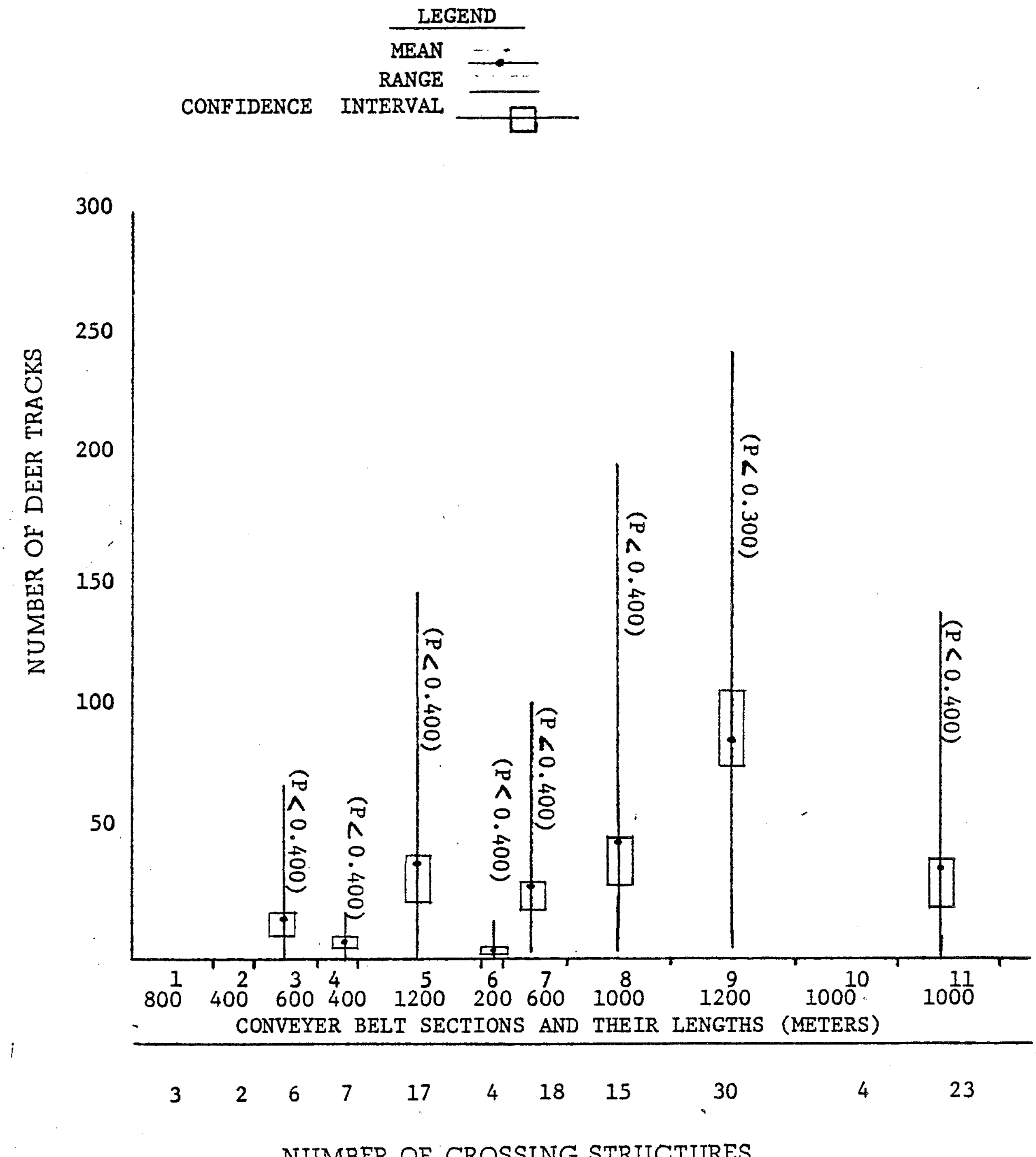

Figure 3. Graphic display of the Range, Mean and Confidence Interval Calculated for the number of deer tracks counted per conveyer section from an on-the-ground survey conducted during the winter of 1979-80. Conveyer section lenghts and numbers of deer crossings per section are also displayed, for Eureka Energy Company's Sage Point-Dugout Canyon Project.

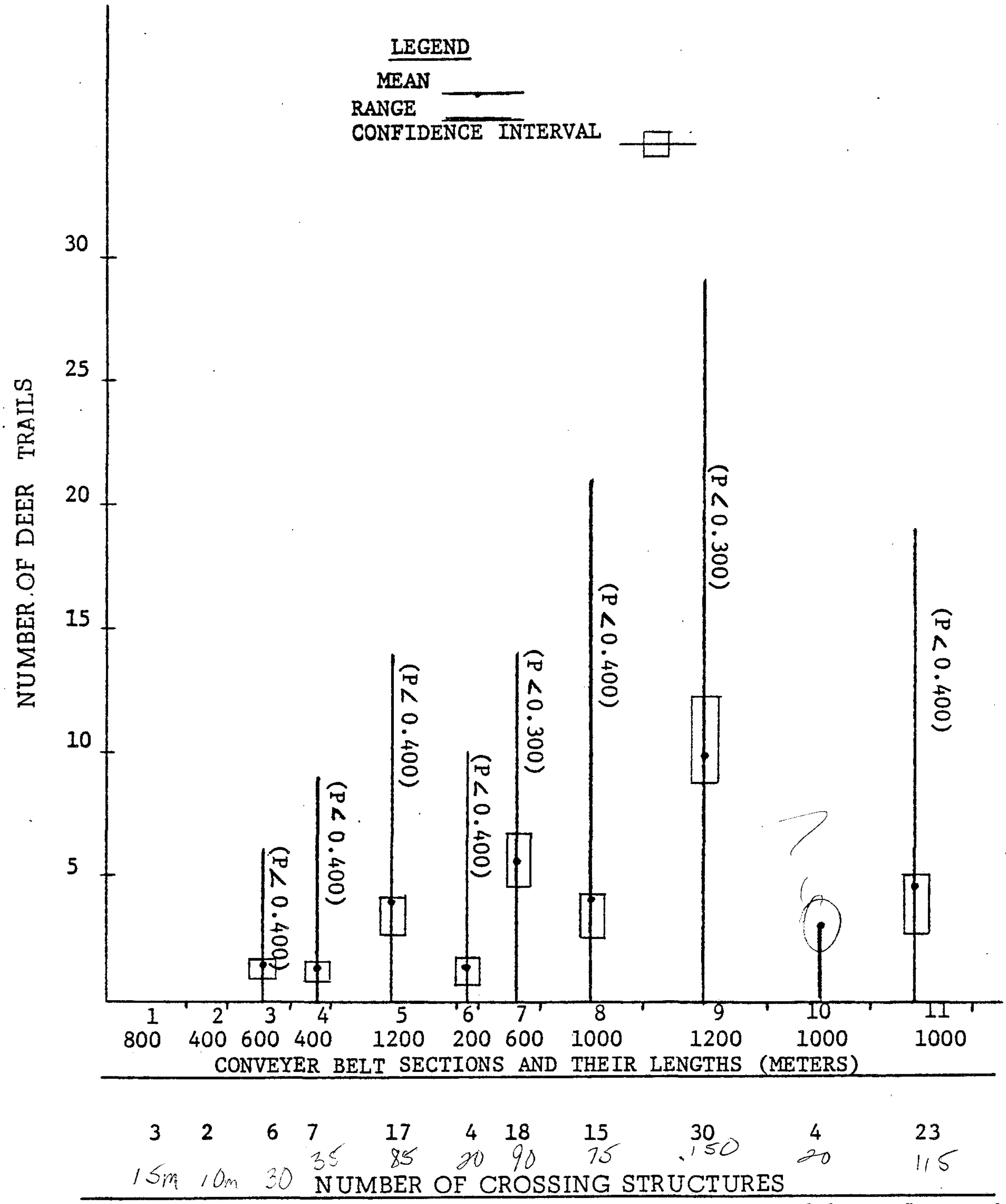

Figure 4. Graphic display of the Range, Mean and Confidence Interval calculated for the number of deer trails counted per conveyer section from an on-the-ground survey conducted during the winter of 1979-80. Conveyer section lenghts and numbers of deer crossings per section are also displayed for Eureka Energy Company's Sage Point-Dugout Canyon Project.

Table 1. Summary of the number of deer tracks counted per conveyer section from an on-the-ground survey and the dates surveyed during the winter of 1979-80. Number of sample periods (N), sample mean ($\bar{X}$), standard deviation (σ), standard error ($s\bar{y}$), and confidence interval (CI) were calculated for each conveyer section along the overland coal conveyer located at Eureka Energy Company's Sage Point-Dugout Canyon Coal Mining Project, Carbon County, Utah.

Coal Conveyer Sections

Date	1	2	3	4	5	6	7	8	9	10	11
December 9	–	–	4	1	9	2	2	22	–	–	13
January 11	0	0	12	3	36	2	15	48	50	0	–
January 16	–	–	–	–	–	7	64	201	245	–	–
January 25	–	–	11	5	33	11	34	123	176	–	31
January 30	–	–	0	0	1	–	–	–	–	–	2
February 6	–	–	2	16	19	6	11	38	84	–	19
February 11	–	–	–	–	–	12	5	10	54	–	–
February 27	–	–	1	0	1	0	3	2	5	–	0
March 5	–	–	0	0	0	0	5	6	14	–	0
March 10	–	–	0	0	0	1	3	1	7	–	0
March 19	–	–	0	0	1	0	1	1	17	–	0
March 26	–	–	0	0	3	2	6	10	3	–	0
April 1	–	–	15	2	4	3	32	10	42	–	2
April 9	–	–	2	2	3	5	35	26	143	–	1
April 14	–	–	2	6	29	6	34	40	102	–	2
April 24	–	–	22	7	32	1	30	21	62	–	17
April 28	–	–	70	9	148	5	48	39	116	–	98
May 5	–	–	34	15	131	15	104	88	134	–	138
May 10	–	–	49	18	33	2	38	46	117	–	45
May 13	–	–	40	14	109	3	76	94	199	–	94
May 17	–	–	40	16	126	11	64	95	129	–	140
May 23	–	–	16	10	60	2	18	41	63	–	86
Total	0	0	320	124	778	96	628	962	1,762	0	688
N	1	1	20	20	20	21	21	21	20	1	19
$\bar{X}$	0	0	16.00	6.35	38.90	4.57	29.90	45.81	87.60	0	36.21
σ	–	–	19.74	6.27	47.95	4.27	27.60	48.64	66.54	–	47.79
$s\bar{y}$	–	–	4.41	1.40	10.72	0.93	6.02	10.61	14.88	–	10.96
CI	–	–	9.75 to 17.18	4.17 to 6.52	23.72 to 41.76	3.06 to 4.63	20.09 to 30.23	29.62 to 47.48	77.19 to 108.79	–	21.25 to 39.75
			($P < 0.400$)	($P < 0.400$)	($P < 0.400$)	($P < 0.400$)	($P < 0.400$)	($P < 0.400$)	($P < 0.300$)		($P < 0.400$)

22 = N

Table 2. Summary of the number of deer trails counted per conveyer section from an on-the-ground survey and the dates surveyed during the winter of 1979-80. Number of sample periods (N), sample mean($\bar{X}$), stand deviation (σ), standard error ($s\bar{y}$), and confidence interval (CI) were calculated for each conveyer section along the overland coal conveyer located at Eureka Energy Company's Sage Point-Dugout Canyon Coal Mining Project, Carbon County, Utah.

	Coal Conveyor Sections										
Date	1	2	3	4	5	6	7	8	9	10	11
December 9	-	-	0	0	0	0	0	6	-	-	2
January 11	0	0	0	0	7	0	1	2	5	3	-
January 16	-	-	-	-	-	0	12	10	29	-	-
January 25	-	-	4	4	7	6	10	21	22	-	14
January 30	-	-	1	0	1	-	-	-	-	-	1
February 6	-	-	3	9	5	8	3	6	7	-	5
February 11	-	-	4	2	-	10	1	2	14	-	1
February 27	-	-	0	0	0	0	0	1	0	-	0
March 5	-	-	0	0	0	0	2	0	3	-	0
March 10	-	-	0	0	0	0	3	1	3	-	0
March 19	-	-	0	0	1	0	2	1	14	-	1
March 26	-	-	0	0	0	0	1	0	1	-	0
April 1	-	-	1	0	1	0	6	0	7	-	0
April 9	-	-	1	0	4	1	7	1	13	-	0
April 14	-	-	0	0	3	3	6	6	15	-	1
April 24	-	-	2	0	2	0	5	3	2	-	0
April 28	-	-	0	2	13	1	3	1	7	-	4
May 5	-	-	0	2	14	0	13	5	8	-	14
May 10	-	-	4	2	2	0	3	4	6	-	1
May 13	-	-	5	2	6	0	7	3	9	-	11
May 17	-	-	3	3	7	1	14	9	24	-	18
May 23	-	-	6	3	7	0	12	4	10	-	15
Total	0	0	34	29	80	30	111	86	199	3	88
N	1	1	20	20	20	21	21	21	20	1	19
$\bar{X}$	0	0	1.50	1.35	4.00	1.43	5.29	4.05	9.95	3	4.58
σ	-	-	1.91	2.17	4.11	2.84	4.40	4.73	7.69	-	6.12
$s\bar{y}$	-	-	0.43	0.49	0.92	0.62	0.96	1.03	1.72	-	1.40
CI	-	-	0.90 to 1.62 (P < 0.400)	0.72 to 1.55 (P < 0.400)	2.59 to 4.14 (P < 0.400)	0.68 to 1.73 (P < 0.400)	4.60 to 6.64 (P < 0.300)	2.54 to 4.28 (P < 0.400)	8.75 to 12.39 (P < 0.300)	-	2.68 to 5.03 (P < 0.400)

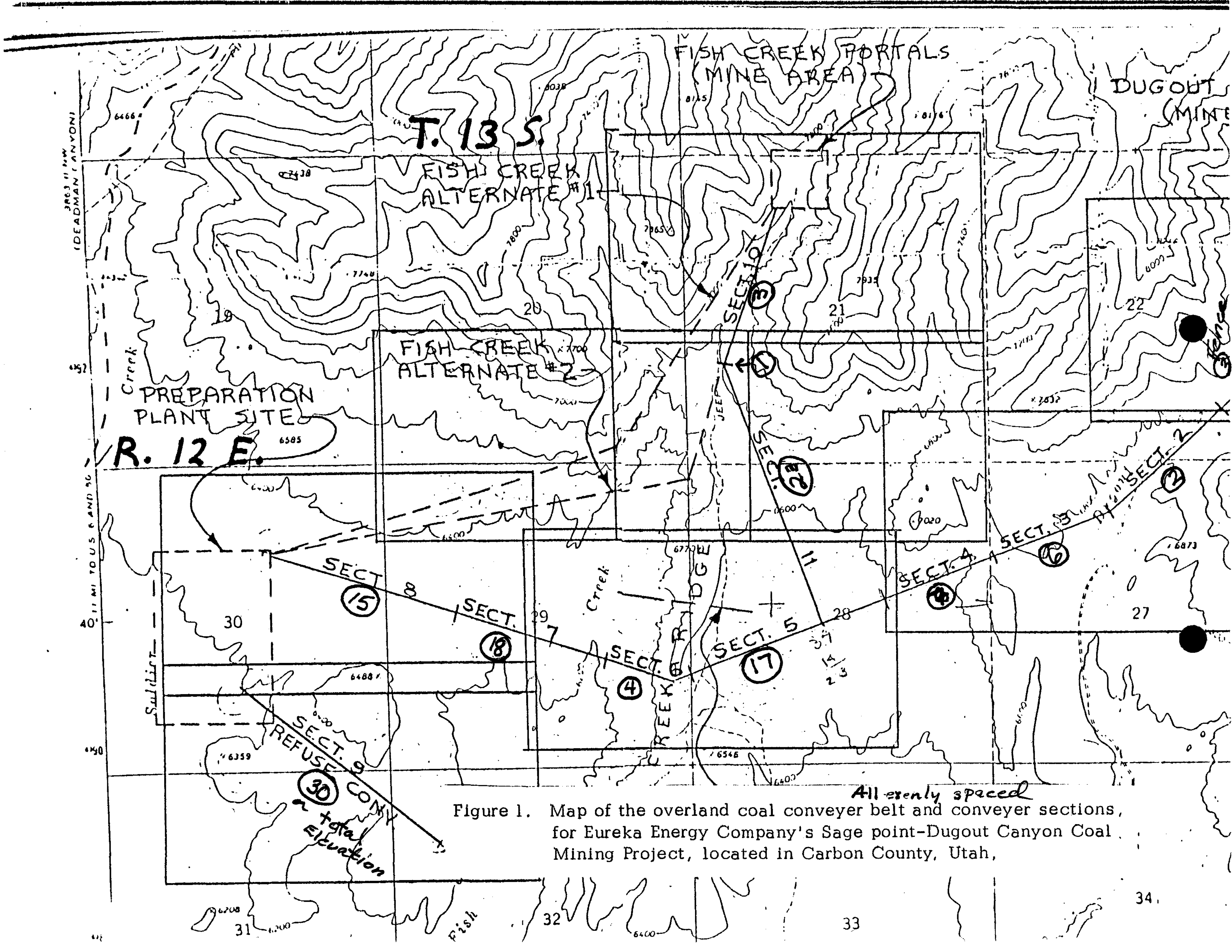

Figure 1. Map of the overland coal conveyer belt and conveyer sections, for Eureka Energy Company's Sage point-Dugout Canyon Coal Mining Project, located in Carbon County, Utah,

Table 3. Summary from Appendix "A" showing the total number of deer tracks per 100 meter length of planned overland coal conveyor. These data were collected during the 1979-80 winter at Eureka Energy Company's Sage Point-Dugout Canyon Coal Mining Project, Carbon County, Utah.

Conveyer Sections (Meters)	100	200	300	400	500	600	700	800	900	1000	1100	1200
Section 8 (1,000 m)	156	117	98	53	69	65	83	88	123	110		
Section 7 (600 m)	133	116	124	80	71	104						
Section 6 (200+ m)	43	53										
Section 5 (1,200 m)	68	25	25	56	53	87	124	47	49	48	67	129
Section 4 (400 m)	28	31	33	32								
Section 3 (800+ m)			23	43	60	71	53	70				
Section 11 (1,200+ m)	98	63	88	104	83	75	74	40	24	39		
Section 9 (1,200 m)	151	162	201	129	66	123	148	123	152	177	228	102
Section 10 (1,000 m)	0	0	0	0	0	0	0	0	0	0		
Section 1 (800+ m)	0	0	0	0	0	0	0	0				
Section 2 (400 m)	0	0	0	0								

Table 4. Summary from Appensix "A" showing the total number of deer trails per 100 meter length of planned overland coal conveyor. These data were collected during the 1979-80 winter at Eureka Energy Company's Sage Point-Dugout Canyon Coal Mining Project, Carbon County, Utah.

	Conveyer Sections (Meters)	100	200	300	400	500	600	700	800	900	1000	1100	1200	
2	.086 Section 8 (1,000 m)	12	11	12	4	7	5	5	12	8	10			86
2	.185 Section 7 (600 m)	15	11	16	24	23	22							111
3	.15 Section 6 (200+ m)	22	8											30
2	.066 Section 5 (1,200 m)	10	6	4	3	4	12	12	4	2	5	13	5	80
3	.072 Section 4 (400 m)	9	3	9	8									29
3	.042 Section 3 (800+ m)			6	6	6	8	3	5					34
2	.073 Section 11 (1,200+ m)	11	4	14	10	12	11	13	5	6	2			88
1	.166 Section 9 (1,200 m)	21	16	22	20	17	12	12	10	8	22	28	11	199
	.003 Section 10 (1,000 m)	0	1	2	0	0	0	0	0	0	0			3
	6 Section 1 (800+ m)	0	0	0	0	0	0	0	0					0
	0 Section 2 (400 m)	0	0	0	0									0